# FISH COMMUNITY SAMPLING IN NATIONAL WILDLIFE AREAS IN SOUTHWESTERN ONTARIO, 2002-2005

D. Marson, J. Barnucz, and N. E. Mandrak

Central and Arctic Region
Fisheries and Oceans Canada
Burlington, ON L7R 4A6

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by

D. Marson, J. Barnucz, and N. E. Mandrak

Central and Arctic Region
Fisheries and Oceans Canada
Burlington, Ontario L7R 4A6

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## ABSTRACT

Marson, D., J. Barnucz, and N.E. Mandrak. 2010. Fish community sampling in National Wildlife Areas in southwestern Ontario, 2002-2005. Can. Manuscr. Rep. Fish. Aquat. Sci. 2918: v + 47 p.

From 2002-2005, Fisheries and Oceans Canada (DFO) sampled the Big Creek, Long Point and St. Clair National Wildlife Areas (NWA). Boat electrofishing, fyke netting and seining were used to survey the fish assemblages in the NWAs. Four species at risk (SAR), including one Endangered (Pugnose Shiner [*Notropis anogenus*]), one Threatened (Lake Chubsucker [*Erimyzon sucetta*]), and two Special Concern (Grass Pickerel [*Esox americanus vermiculatus* ] and Warmouth [*Lepomis gulosus*]) were captured. Three SAR were captured in Big Creek NWA (Grass Pickerel, Lake Chubsucker and Warmouth), three in Long Point NWA (Grass Pickerel, Lake Chubsucker and Pugnose Shiner); however, none were detected in the St. Clair NWA. A preference for clear water with a high density of submergent and emergent aquatic vegetation by the three SAR captured was confirmed. Additional sampling is recommended to monitor the presence of fish SAR in, or near, the NWAs sampled.

## RÉSUMÉ

Marson, D., J. Barnucz, and N.E. Mandrak. 2010. Fish community sampling in National Wildlife Areas in southwestern Ontario, 2002-2005. Can. Manuscr. Rep. Fish. Aquat. Sci. 2918: v + 47 p.

Entre 2002 et 2005, Pêches et Océans Canada (MPO) a procédé à des échantillonnages dans les réserves nationales de faune (RNF) de Big Creek, Long Point et St. Clair. La pêche à l'électricité en bateau, la pêche au verveau et la pêche à la senne ont été utilisées pour effectuer les relevés des assemblages de poissons dans les RNF. Quatre espèces en péril (EP), dont une espèce en voie de disparition (le Méné Camus [*Notropis anogenus*]), une espèce menacée (le Sucet de Lac [*Erimyzon sucetta*]), et deux espèces préoccupantes (le Brochet Vermiculé [*Esox americanus vermiculatus*] et le Crapet Sac-à-Lait [*Lepomis gulosus*]) ont été capturées. Trois EP ont été capturées dans la RNF de Big Creek (le Brochet Vermiculé, le Sucet de Lac et le Crapet Sac-à-Lait), et dans la RNF de Long Point (le Brochet Vermiculé, le Sucet de Lac et le Méné Camus); cependant, aucune n'a été détectée dans la RNF de St. Clair. La préférence des trois EP capturées pour des eaux claires ayant une végétation aquatique partiellement submergée et émergée de haute densité a été confirmée. Des échantillonnages supplémentaires sont recommandés afin de surveiller la présence d'espèces de poisson en péril dans les RNF échantillonnées ou à proximité.

## INTRODUCTION

National Wildlife Areas have been created throughout Canada to preserve wildlife by ensuring that suitable habitat is protected for a variety of plants and animals. Between 2002 and 2005, Fisheries and Oceans Canada (DFO) sampled the Big Creek, Long Point, and St. Clair National Wildlife Areas (NWA). Long Point NWA, a 3250 ha protected area, was established in 1978 and is located approximately 115 km southwest of Toronto, on the north shore of Lake Erie (Figure 1). Big Creek NWA, an 802 ha protected area established in 1978, is located adjacent to Long Point NWA, at the base of Long Point's extension into Lake Erie next to the town of Port Rowan, Ontario (Figure 2). The St. Clair NWA, a 289 ha protected area, was established in 1978 and is located on the shore of Lake St. Clair, approximately 30 km directly south of Sarnia and 15 km west of Chatham (Figure 3).

Sampling was undertaken to survey the fish assemblages in the NWAs and specifically targeted fish species at risk (SAR). Several fish SAR, including Grass Pickerel (*Esox americanus vermiculatus*) (common and scientific names according to Nelson et al. 2004; listed in Appendix 1), Lake Chubsucker (*Erimyzon sucetta*), Pugnose Shiner (*Notropis anogenus*), Spotted Gar (*Lepisosteus oculatus*), and Warmouth (*Lepomis gulosus*) have been historically captured in, or in close proximity to, one or more of the NWAs sampled (Mandrak and Crossman 1992). Four of these species were captured in the current study, including one Endangered (Pugnose Shiner), one Threatened (Lake Chubsucker), and two of Special Concern (Grass Pickerel and Warmouth). From the data gathered, a comparison of three sampling techniques was performed to determine their relative success in capturing diverse fish species. The sampling techniques included two active methods, boat electrofishing and seining, and one passive method, fyke netting. Site and habitat information were analyzed from sites where SAR were captured in an attempt to gain a better understanding of the species' habitat preferences.

## METHODS

### ELECTROFISHING SAMPLING

Boat electrofishing was employed in Long Point and Big Creek sampling. In 2002, boat electrofishing sampling was performed using a single boom, 4.57 m johnboat equipped with a 5.0 GPP (gas powered pulsator), a 5.0 kW generator, and three foot pedals. A single netter retrieved fishes as they were stunned and transferred them into bins filled with water until sampling of the site was completed. The species were identified, counted, and released. Minimum and maximum total lengths were recorded for all species captured. Individual lengths were recorded for any SAR caught during sampling. Voucher specimens were kept for lab verification. In 2004, boat electrofishing was performed using a 6.35 m Model SR-20 Smith-Root electrofishing boat equipped with a Model 7.5 kW Smith-Root generator, 7.5 GPP control box, three kick plates, and dual foot pedals. Methods were consistent with those listed above, with

the exception of having two netters retrieving stunned fishes and placing captured fish into an aerated live-well.

**SEINING**

Seining was performed in 2005 using an 8.5 m bag seine with 6.35 mm ace mesh. Seining occurred at a single site in Big Creek on June 7, 2005. Seining was conducted with one end of the net remaining in contact with the shoreline while the other is hauled parallel to the shoreline at either the full length of the net (from the shoreline) or as far as water depth will allow waders to safely proceed. Although the seining protocol involves a minimum of three hauls per site, with an additional three following the capture of a new species, only two hauls were performed during the 2005 sampling due to net damage. It was determined that the habitat was unsuitable for further seining efforts. Fishes were identified, counted, and released. Minimum and maximum total lengths were recorded for all species captured. Individual lengths were recorded for all SAR caught during sampling. Voucher specimens were kept for lab verification.

**FYKE NET SAMPLING**

Fyke net sampling was performed using nets with 6.4 mm square mesh, an inner hoop diameter of 15 cm, a wing length of 7.62 m, and a lead length of 15.24 m. Fyke nets were set perpendicular to shore, with the lead set at the waters edge. Fyke nets were set, left overnight, and fished the following day at approximately the same time (24 h sets). Effort was recorded as the difference between Start Time (the time the net was set) and Stop Time (the time of retrieval). Fishes that were caught were identified, counted, and released. Minimum and maximum total lengths were recorded for all species captured. Individual lengths were recorded for all SAR caught during sampling. Voucher specimens were kept for lab verification.

**HABITAT DATA COLLECTION**

Habitat variables recorded at each site included air temperature (°C), water temperature (°C), conductivity (µS/cm), water depth (m), Secchi depth (m), substrate composition (% based on Wentworth scale), aquatic vegetation (% emergent, % submergent, % floating), riparian vegetation (%), sampling distance from shore (m), and weather conditions. Habitat data were collected prior to sampling with fyke nets or seining but followed sampling when electrofishing.

## RESULTS

**BIG CREEK NWA**

***Electrofishing Sampling***

A total of five sites were sampled by boat electrofishing in the vicinity of Big Creek NWA (Figure 1). The boat electrofishing took place on June 18, 2002. Of the five sites

sampled by boat electrofishing, four sites were adjacent to, but outside of, the NWA boundary and will be considered separately from sampling that occurred within the boundaries.

Site 31 was the only boat electrofished site that fell within Big Creek NWA boundaries. Site 31 was electrofished for a total of 3241 sec. A total of 43 fishes representing eight different species were captured (Tables 1 and 3). The mean CPUE was 47.76 fish/h, and the mean effort per site was 54.02 min (Table 2).

Sites 28, 29, 30, and 32 were located adjacent to, but outside of, the Big Creek NWA boundary. The total electrofishing effort for these sites was 10 248 sec, with an average of 2562 sec per site. A total of 97 fishes were captured representing 16 species (Tables 1, 3, 4). The mean CPUE was 37.04 fish/h and the mean effort per site was 42.7 min (Table 2). The minimum number of fishes captured was 14 and the maximum number was 35 (Table 3).

***Fyke Net Sampling***

A total of 26 sites were sampled in the Big Creek NWA, from June 6 to June 16 2005, using fyke nets (Figure 1). The fyke net sampling resulted in the capture of 345 fishes representing 18 species (Tables 1, 3, 4). The mean CPUE was 0.55 fish/h and the mean effort per site was 24.08 h (Table 2). The minimum number of fishes per site captured was zero, and the maximum number was 68 (Table 1).

***Seining***

A single site (Site 6) was sampled by seining inside Big Creek on June 7, 2005 (Figure 1). Two hauls resulted in the capture of 22 fishes representing 6 species (Tables 1, 3, 4).

***Habitat Data***

All sites sampled were 100% vegetated with emergent and submergent vegetation (Appendix 2). Secchi depth ranged from a low of 0.54 m at Site 1 to greater than 1.2 m at Sites 12, 19, 21, 22, 24, 25, 26, and 27 (Appendix 2). Habitat data were not recorded for Sites 28-32.

***Species at Risk***

Three SAR, Grass Pickerel, Lake Chubsucker, and Warmouth were captured during the Big Creek NWA sampling. A total of two Grass Pickerel were captured from two sites (26 and 30). Site 26 was sampled by fyke netting while Site 30 was sampled by boat electrofishing. Site 26 was 100% vegetated with emergent vegetation. Habitat data were not recorded for Site 30.

A total of 13 Lake Chubsucker were captured from five sites (Sites 20, 23, 25, 26, 27), all of which were collected using fyke nets. The sites containing SAR were 100% vegetated with a combination of submergent and emergent vegetation. The Secchi depth was greater than the water depth in all but one of the sites (Site 23). At each of the sites, the substrate was composed primarily of a combination of silt and organic matter.

A total of 11 Warmouth were captured from two sites (23 and 26), both sampled using fyke nets. Ten Warmouth were captured in a single set at Site 23. Both of the sites were 100% vegetated with emergent and submergent vegetation. Secchi depth was greater than water depth at Site 26 but was 0.76 m at Site 23, where water depth was 2 m. Both of the sites had substrate dominated by silt and organic matter.

## LONG POINT NWA

### *Electrofishing Sampling*

A total of 61 sites were electrofished in the vicinity of Long Point NWA between June 19, 2002 and August 30, 2004 (Figure 2). Of the 61 sites sampled, seven fell within Long Point NWA boundaries (Sites 25, 26, 27, 30, 31, 32, 66). The remaining 54 sites were located adjacent to, but outside of, the NWA boundary, and will be analyzed separately.

A total of 318 fishes representing 24 species were caught at the seven sites electrofished within Long Point NWA. The mean CPUE was 250.39 fish/h and the mean effort/site was 0.18 h (648 sec) (Table 6). The minimum number of fishes caught was 10 (Site 26) and the maximum was 84 (Site 31) (Table 5).

The 54 sites sampled outside the NWA produced 2390 fishes representing 33 species (Tables 7 and 8). The mean CPUE was 271.84 fish/h and the mean effort/site was 0.15 h (540 sec) (Table 6). The minimum number of fishes caught was zero (Sites 41, 42, 52, 53, 54, 58, 59, 60, 62, 63) and the maximum was 200 (Site 75) (Table 5).

### *Fyke Net Sampling*

A total of 24 sites were sampled with fyke nets in Long Point NWA June 22-30, 2005 (Figure 2). All but Site 24 were located within the Long Point NWA boundaries. A total of 501 fishes representing 16 species, were caught inside the NWA boundary (Tables 5 and 7). The mean CPUE was 0.9 fish/h and the mean effort/site was 24.22 h (Table 6). The minimum number of fishes caught was zero (Site 8) and the maximum was 183 fishes (Site 20) (Table 5).

Site 24 was the only site sampled in 2005 outside of Long Point NWA. Only a single fish, a Pumpkinseed (*Lepomis gibbosus*), was captured in the 24 h fyke net set, resulting in a CPUE of 0.04 fish/h (Tables 5 and 6).

***Habitat Data***

All of the sites, except 26, 28, 32, 35, 40-45, and 47, were 100% vegetated. Emergent and submergent vegetation were the dominant vegetation types present. Secchi depth was equal to, or greater than, maximum water depth in all but Sites 50, 51, 54, 59, 60, 65, 69, 70, 71, and 73-78. The range of Secchi depth was from a low of 0.55 m at Site 66 to a high of 3.8 m at Site 58. Habitat data were not recorded for Sites 82-85.

***Species at Risk***

Three SAR, Grass Pickerel, Lake Chubsucker, and Pugnose Shiner, were captured during the Long Point NWA sampling. A total of five Grass Pickerel were captured from four sites (25, 36, 70, and 75). All four sites were sampled by boat electrofishing. Site 25 was located within Long Point NWA, while Sites 36, 70, and 78 were located outside, but adjacent to, Long Point NWA. Site 25 was 100% vegetated, composed of equal parts emergent and submergent vegetation. Site 36 was composed of 60% emergent vegetation and 40% submergent. Site 70 was 50% vegetated, all of which was emergent, while Site 75 was 40% vegetated, with equal parts emergent and submergent vegetation. Secchi depth was equal to maximum water depth at Site 25, was not recorded at Site 36, and was 1.4 m at Site 70, and 0.8 m at Site 75. Sand and silt were the primary substrate components associated with sites where Grass Pickerel were located.

A total of two Lake Chubsucker were captured from two sites (20 and 29). Site 20 was sampled using a fyke net whereas, Site 29 was sampled by boat electrofishing. Site 20 was located within the Long Point NWA boundary, however, Site 29 was located outside, but adjacent to, the NWA. Both sites were 100% vegetated, composed of emergent and submergent vegetation. Secchi depth equalled or exceeded maximum water depth at both sites. Substrate was predominantly comprised of silt and organic matter at both sites.

A total of 30 Pugnose Shiner were captured from 13 sites, only one of which was located within the Long Point NWA (Site 66). All Pugnose Shiner were caught boat electrofishing between July 6 and August 30, 2004. The maximum number of Pugnose Shiner caught in a single site was 11 (Site 71). Eight of the 11 sites were 100% vegetated, primarily with emergent and submergent vegetation. Only a single site (Site 75) was comprised of less than 50% aquatic vegetation. Secchi depth was equal to, or exceeded, maximum water depth at all but 3 sites (Sites 69, 71, and 75). Sand, silt and organic matter were the most dominant substrate components associated with Pugnose Shiner capture.

## ST. CLAIR NWA

### *Fyke Net Sampling*

A total of 20 sites were sampled in the St. Clair NWA from July 6 to 14, 2005 (Figure 3). All of the sites were sampled using fyke nets. A total of 134 fishes representing 12 species were captured during the sampling (Table 9, 10, 11). The total sampling effort was 480 h, resulting in a mean CPUE of 0.28 fish/h (Table 10). The minimum catch per site was one fish (at Sites 4, 10, 14) and the maximum catch was 30 fishes (Site 3) (Table 9).

### *Habitat Data*

Sites 1-11, 19, and 20, were all 100% vegetated (Appendix 3) and were dominated by emergent and submergent vegetation. Only Sites 14 and 17 had less than 50% vegetation. Secchi depth exceeded maximum water depth at all sites, except Site 14, indicating that the turbidity level was very low throughout the sampled sites.

### *Species at Risk*

No SAR were captured during the sampling of the St. Clair NWA.

## DISCUSSION

Gear comparisons within the respective NWAs highlight the relationship between gear efficiency and effort. Although although the gear efficiency in terms of CPUE may have been low for a particular gear, it may still have resulted in the highest catch due to the amount of effort directed to the gear. For example, boat electrofishing within the Big Creek NWA boundary had a mean CPUE of 47.76 fish/h whereas, fyke netting had a mean CPUE of 2.55 fish/h. Although the total number of fishes captured by fyke netting in Big Creek (n = 345) was greater than the number caught by boat electrofishing both inside (43) and outside (97) the NWA boundary, the mean number of fishes caught per site was greater for both electrofishing inside (43) and outside (24.25) than fyke netting (13.27, Table 1). The higher total catch by fyke netting is the result of a greater sampling effort through this method (26 sites sampled by fyke net sampled vs 5 sites sampled by boat electrofishing).

The greater total number of species and unique species (a species detected by a single sampling method) captured using fyke nets (total number = 18, unique species = 8), relative to electrofishing inside (8, 0) and outside (16, 5) the Big Creek NWA (Table 3) is also reflective of the greater sampling effort using fyke nets. Despite the large discrepancy between boat electrofishing CPUE and fyke netting CPUE, the significantly greater amount of sampling effort by fyke netting resulted in a higher total number of fishes caught, as well as higher species richness.

Species at risk in Big Creek NWA were captured by both boat electrofishing and fyke netting. All three SAR were captured using fyke nets. This increased capture efficiency may be due to increased sampling effort, but it should be considered that fyke netting may be a more effective method of capturing Grass Pickerel, Lake Chubsucker, and Warmouth.

The relationship between the electrofishing and fyke netting in Long Point NWA was opposite to that in Big Creek NWA, as electrofishing sampling effort was greater than fyke netting effort at Long Point NWA. Although only seven sites were electrofished within Long Point NWA, another 54 sites were sampled outside, whereas only 23 sites were sampled using fyke nets inside the NWA boundary and one site outside the NWA. As a result, the total number of fishes captured electrofishing outside the Long Point NWA boundary was greatest (2390), followed by fyke netting inside (501), electrofishing inside (318), and fyke netting outside (1) (Table 5). The greatest number of species and unique species captured was by electrofishing outside and inside, followed by fyke netting inside and outside (Table 7). Despite fewer sites sampled inside the Long Point NWA boundary, electrofishing inside Long Point NWA resulted in the capture of greater species richness than fyke netting.

Species at risk were captured both by fyke netting and electrofishing in Long Point NWA, however, one of two Lake Chubsucker, all five Grass Pickerel, and all of the 30 Pugnose Shiner were caught electrofishing (Table 8). Boat electrofishing appears to be more effective at capturing Pugnose Shiner than fyke netting, although 29 of the 30 Pugnose Shiner were captured outside Long Point NWA boundaries, where only a single fyke net set was fished. Additionally, the only pugnose shiner captured inside the Long Point NWA was captured by boat electrofishing (in one of 7 sites inside the NWA boundary) and was not detected in any of the 23 fyke net sites inside the boundary.

Boat electrofishing sampling was performed in Big Creek NWA (5 sites) and Long Point NWA (61 sites). Effort and catch data have been divided between those sites which were sampled within, and outside, the NWA boundary. The mean effort per site located inside and outside Big Creek and Long Point NWAs were 54.02, 42.70, 10.80, and 9 min, respectively. Clearly the effort/site was much higher in Big Creek NWA, which resulted from targeted sampling for Spotted Gar in 2002. The Spotted Gar targeted sampling involved more prolonged electrofishing sampling events than typical community sampling. Similar targeted sampling efforts of up to 29 min were conducted in Long Point NWA at Sites 69-85, some of which were sampled for Spotted Gar in 2002. Standardized sampling (100 sec) at Sites 39-68 resulted in the reduction of the overall mean effort per site in the Long Point NWA sampling. This reduction in mean effort may help to explain the difference in mean CPUE between Big Creek and Long Point sites inside and outside the NWAs of 47.76, 34.07, 250.39, and 271.85 fish/h, respectively. The difference in mean CPUE may be a result of either the Spotted Gar targeted sampling being more selective in what was netted (not netting every stunned fish) or that the CPUE while boat electrofishing diminishes as sampling time increases (perhaps due to netter fatigue) .

Fyke net sampling was conducted at all of the NWAs: Big Creek (26 sites), Long Point (24 sites), and St. Clair (20 sites). A single site in Long Point NWA was located outside, but adjacent to, the NWA boundary, but will be combined with the Long Point data for this analysis. The mean effort per site in Big Creek, Long Point, and St. Clair NWAs was 24.08, 24.21, and 24 h, respectively. The mean catch was 0.55, 0.87, and 0.28 fish/h, respectively. Fyke netting was successful in locating all three SAR caught in Big Creek, one of three in Long Point NWA (Lake Chubsucker), and no SAR were detected in St. Clair NWA.
Seine net sampling was conducted exclusively in the Big Creek NWA. A single site was sampled, resulting in the capture of 22 fishes representing 6 species. No SAR were detected by seining.

Boat electrofishing was an effective means of collecting a large number of diverse species in a relatively small amount of sampling time, however, sampling is limited to areas of sufficient depth where the boat can be manoeuvred around obstacles and can be limited by extensive macrophyte growth. In circumstances where boat electrofishing is limited, seining and fyke netting represent alternative sampling options. The most effective gear type is site-specific and will depend on site conditions. If, however, a more accurate analysis of gear comparison is required, it would be wise to sample the same sites with the gears being compared. Although the current analysis provides some trends in gear selectivity, by minimizing the time between sampling visits, and the distance between the sites being sampled by the various gear types, it will be possible to develop a more accurate comparison.

**CRITICAL HABITAT**

Of the sites where SAR were captured, only a single site had less than 50% vegetation, with 15 of 22 sites being 100% vegetated. Submergent and emergent vegetation were the most dominant vegetation types associated with the capture of SAR. At all but five sites where SAR were caught, the Secchi depth readings were limited by the water depth (i.e. Secchi depth was greater than the maximum water depth), while the lowest Secchi depth reading for all the sites where SAR were caught was 0.55 m. These findings indicate a preference for clear water with a high density of submergent and emergent aquatic vegetation by the Grass Pickerel, Lake Chubsucker, Pugnose Shiner, and Warmouth captured during the study. T-test analyses indicated that sites in which Pugnose Shiner were located had significantly more vegetation than sites in which Pugnose Shiner were not found ($p<0.05$), suggesting a preference by this species for highly vegetated habitats. Pugnose Shiner sites also had a significantly lower percentage of organic substrate and were composed of significantly less emergent vegetation ($p<0.05$). This would suggest that Pugnose Shiner prefer sites with higher submergent vegetation, however, although the mean percent submergent vegetation in Pugnose Shiner sites was higher than in non-Pugnose Shiner sites, there was not a significant difference (t-test, $p>0.05$).

A t-test analysis of Lake Chubsucker habitat preferences in Long Point NWA and Big Creek NWA suggests a preference for higher overall percentage of aquatic vegetation,

with a preference for submergent vegetation ($p<0.05$). Sites without Lake Chubsucker had significantly higher percentages of emergent vegetation ($p<0.05$) and a significantly higher percentage of sandy substrate ($p<0.05$). Therefore, Lake Chubsucker appears to prefer highly vegetated sites, composed primarily of submergent vegetation with a primarily organic substrate composition.

All four SAR seemed to prefer a combination of sand, silt, and organic matter as substrate. An organic matter-dominated substrate preference was noted for Lake Chubsucker, while Pugnose Shiner seemed to prefer a primarily sandy substrate, and Warmouth preferred higher proportions of silt and organic matter. The substrate preferences correspond with those documented in the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status reports for the Lake Chubsucker (Mandrak et al. 2005), Pugnose Shiner (Holm and Mandrak 2002) and Warmouth (Crossman et al. 1994). Although Grass Pickerel substrate preferences were unclear, the association with highly vegetated sites consisting of emergent and submergent vegetation matches that documented in the COSEWIC status report (Crossman and Holm 2005). Therefore, consistent with the COSEWIC status reports, the four SAR captured in this study require systems with a dense mixture of submergent and emergent vegetation, low turbidity, and substrate comprised of silt, sand, and organic debris.

## MONITORING RECOMMENDATIONS

### *Big Creek NWA*

Boat electrofishing and fyke net sampling of Big Creek NWA resulted in the capture of two Grass Pickerel, 13 Lake Chubsucker, and 11 Warmouth. Although this provides evidence of their presence in the NWA, it is necessary to continue sampling to determine the distribution and abundance of these species.

While Spotted Gar have been documented in Big Creek wetland and both Pugnose Shiner and Spotted Gar have been documented in Long Point Bay (Holm and Mandrak 2002, COSEWIC 2005a), neither of these species were captured during DFO sampling at Big Creek from 2002 to 2005. The habitat characteristics documented at most of the sites sampled are consistent with the habitat requirements listed in the COSEWIC status reports, with most sites being heavily vegetated and having Secchi depths exceeding the maximum sampling depth, therefore, the absence of Pugnose Shiner and Spotted Gar was not the result of targeting inappropriate habitats. Further targeted sampling of Pugnose Shiner and Spotted Gar preferred habitats may re-establish their presence. It may be valuable to increase boat electrofishing effort, as well as incorporating other sampling techniques such as seining.

### *Long Point NWA*

Grass Pickerel, Lake Chubsucker, and Pugnose Shiner were all collected within, and adjacent to, Long Point NWA. However, only a single Grass Pickerel, Lake Chubsucker

and Pugnose Shiner were captured within Long Point NWA. Despite providing evidence of their presence in the NWA, few fishes were found utilizing the habitat within the NWA. The actual populations of Grass Pickerel, Lake Chubsucker, and Pugnose Shiner located in the NWA may, nevertheless, prove to be much larger following additional sampling of the area.

Other SAR, including the Spotted Gar and Warmouth, had been documented in Long Point Bay but were not located during the Long Point NWA sampling. Considering that Warmouth was captured in Big Creek NWA, it is likely that with additional sampling effort in similar habitat, their presence would be detected in Long Point NWA as well.
As with Big Creek NWA sampling, the majority of sites sampled in Long Point NWA had high water clarity and were primarily 100% vegetated with emergent and submergent vegetation. Therefore, the absence of Spotted Gar and Warmouth is unlikely a result of targeting unsuitable habitat and more likely a result of insufficient sampling effort. It is recommended that additional sampling should target areas with high water clarity and heavy emergent and submergent vegetation.

***St. Clair NWA***

Although the Lake Chubsucker has recently been documented in the St. Clair NWA (Mandrak et al. 2005), they were not captured during the 2005 fyke net sampling performed by DFO. Grass Pickerel have also been documented in the vicinity of St. Clair NWA and may be detected with additional sampling. Continued fyke net sampling, along with electrofishing and seining (where possible), is advised to verify the continued presence and abundance of Lake Chubsucker in the St. Clair NWA and to establish whether Grass Pickerel are present. Sampling should target areas with heavy emergent and submergent vegetation and high water clarity.

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Table 1: Summary of catch data by gear type inside and outside of Big Creek NWA.

| Catch Data | BEF* (Inside) | BEF* (Outside) | FN* (Inside) | Seine (Inside) |
|---|---|---|---|---|
| Total Fishes Caught | 43 | 97 | 345 | 22 |
| Mean Fishes | 43 | 24.25 | 13.27 | 22 |
| Minimum Number of Fishes Caught | 43 | 14 | 0 | 22 |
| Maximum Number of Fishes Caught | 43 | 35 | 68 | 22 |

*BEF – boat electrofishing;
*FN – fyke net

Table 2: Summary of sampling effort by gear type inside and outside of Big Creek NWA.

| Sampling Effort | BEF* (Inside) | BEF* (Outside) | FN* (Inside) |
|---|---|---|---|
| Mean CPUE (fish/h) | 47.76 | 34.07 | 0.55 |
| Mean Effort/Site | 54.02 | 42.7 | 1444.8 |
| Total Sampling Effort | 0.9 | 2.85 | 626 |

*BEF – boat electrofishing;
*FN – fyke net

Table 3: Summary of species detection inside and outside of Big Creek NWA.

| | BEF* (Inside) | BEF* (Outside) | FN* (Inside) | Seine (Inside) |
|---|---|---|---|---|
| Species Richness | 8 | 16 | 18 | 6 |
| Unique Species | 0 | 5 | 8 | 0 |
| Common Species | 8 | 11 | 10 | 6 |
| **Total Species** | **25** | | | |

*BEF – boat electrofishing;
*FN – fyke net

Table 4: Total number of each species captured by gear type inside and outside of Big Creek NWA. COSEWIC status: EN – Endangered, SC – Special Concern

| Common Name | BEF* (Inside) | BEF* (Outside) | FN** (Inside) | Seining (Inside) |
|---|---|---|---|---|
| Alewife | | 1 | | |
| Black Bullhead | | 2 | | |
| Black Crappie | | | 41 | |
| Blackchin Shiner | | | 1 | |
| Bluegill | 9 | 22 | 19 | 1 |
| Bluntnose Minnow | | 2 | 4 | 4 |
| Bowfin | | | 11 | |
| Brook Silverside | | 1 | | |
| Brown Bullhead | 7 | 8 | 22 | |
| Central Mudminnow | | | 1 | |
| Common Carp | | 2 | | |
| Emerald Shiner | | | 2 | 6 |
| Freshwater Drum | | 2 | | |
| Gizzard Shad | 1 | 4 | | |
| Golden Shiner | | 3 | 44 | |
| Grass Pickerel (**SC**) | | 1 | 1 | |
| Lake Chubsucker (**EN**) | | | 13 | |
| Largemouth Bass | 1 | 4 | 2 | |
| Longnose Gar | | | 5 | |
| Northern Pike | 1 | 3 | | |
| Pumpkinseed | 10 | 26 | 117 | 3 |
| Rainbow Trout | | | 1 | |
| Rock Bass | 2 | 2 | 43 | 2 |
| Warmouth (**SC**) | | | 11 | |
| Yellow Perch | 12 | 14 | 7 | 6 |

*BEF – boat electrofishing;
**FN – fyke net

Table 5: Summary of catch data by gear type inside and outside of Long Point NWA.

| Catch Data | BEF* (Inside) | BEF* (Outside) | FN** (Inside) | FN** (Outside) |
|---|---|---|---|---|
| Total Fishes Caught | 318 | 2390 | 501 | 1 |
| Mean Fishes Caught/Site | 45.43 | 44.26 | 21.78 | 1 |
| Minimum Number of Fishes Caught | 10 | 0 | 0 | 1 |
| Maximum Number of Fishes Caught | 84 | 200 | 183 | 1 |

*BEF – boat electrofishing;
**FN – fyke net

Table 6: Summary of sampling effort by gear type inside and outside of Long Point NWA.

| Sampling Effort | BEF* (Inside) | BEF* (Outside) | FN** (Inside) | FN** (Outside) |
|---|---|---|---|---|
| Mean CPUE (fish/h) | 250.39 | 271.84 | 0.9 | 0.04 |
| Mean Effort/Site (h) | 0.18 | 0.15 | 24.22 | 24 |
| Total Sampling Effort (h) | 1.27 | 8.24 | 557 | 24 |

*BEF – boat electrofishing;
**FN – fyke net

Table 7: Summary of species detection by gear type inside and outside of Long Point NWA.

| Species Detection | BEF* (Inside) | BEF* (Outside) | FN* (Inside) | FN* (Outside) |
|---|---|---|---|---|
| Species Richness | 24 | 33 | 16 | 1 |
| Unique Species* | 2 | 8 | 1 | 0 |
| Common Species | 22 | 25 | 15 | 1 |
| **Total Species Richness** | **36** | | | |

*BEF – boat electrofishing;
*FN – fyke net
* Unique Species = a species which was only caught by a single gear type

Table 8: Total number of each species captured by gear type inside and outside Long Point NWA, with total number of specimens captured in cell. COSEWIC status: EN – Endangered, SC – Special Concern

| Common Name | BEF* (Inside) | BEF* (Outside) | FN** (Inside) | FN** (Outside) |
|---|---|---|---|---|
| Banded Killifish | 1 | 11 | 1 | |
| Black Bullhead | 2 | 5 | | |
| Black Crappie | | | 12 | |
| Blackchin Shiner | 58 | 122 | 6 | |
| Blacknose Shiner | 2 | 36 | | |
| Bluegill | 6 | 202 | 8 | |
| Bluntnose Minnow | 10 | 87 | 1 | |
| Bowfin | 3 | 3 | 2 | |
| Brook Silverside | 3 | 14 | | |
| Brown Bullhead | 14 | 158 | 22 | |
| Channel Catfish | 1 | | | |
| Common Carp | 4 | 29 | | |
| Emerald Shiner | 7 | 265 | | |
| Freshwater Drum | 1 | 11 | | |
| Gizzard Shad | | 3 | | |
| Golden Shiner | 13 | 61 | 111 | |
| Goldfish | | 13 | | |
| Grass Pickerel (**SC**) | 1 | 4 | | |
| Iowa Darter | | 1 | | |
| Johnny Darter | | 6 | | |
| Lake Chubsucker (**EN**) | | 1 | 1 | |
| Largemouth Bass | 11 | 131 | 1 | |
| Logperch | | 3 | | |
| Longnose Gar | 15 | 10 | 8 | |
| Mimic Shiner | 1 | 50 | | |
| Northern Pike | | 13 | 2 | |
| Pugnose Shiner (**EN**) | 1 | 29 | | |
| Pumpkinseed | 38 | 387 | 300 | 1 |
| Rock Bass | 3 | 24 | 6 | |
| Round Goby | | 8 | | |
| Smallmouth Bass | | 1 | | |
| Spotfin Shiner | 4 | | | |
| Spottail Shiner | | 11 | | |
| Tadpole Madtom | | 1 | 18 | |
| Yellow Bullhead | 1 | 1 | | |
| Yellow Perch | 118 | 689 | 3 | |

*BEF – boat electrofishing;
**FN – fyke net

Table 9: Summary of catch data by gear type in St. Clair NWA sites.

| Catch Data | Fyke Netting |
|---|---|
| Total Fishes Captured | 134 |
| Mean Fishes Captured/Site | 6.7 |
| Minimum Number of Fishes Captured | 1 |
| Maximum Number of Fishes Captured | 30 |

Table 10: Summary of sampling effort by gear type in St. Clair NWA sites.

| Sampling Effort | Fyke Netting |
|---|---|
| Mean CPUE (catch/h) | 0.28 |
| Mean Effort/Site | 24 |
| Total Sampling Effort (h) | 480 |

Table 11: Summary of species captured by gear type in St. Clair NWA fyke net sampling.

| Common Name | Fyke Netting |
|---|---|
| Black Crappie | 10 |
| Bluegill | 19 |
| Bowfin | 17 |
| Brown Bullhead | 2 |
| Central Mudminnow | 1 |
| Common Carp | 1 |
| Golden Shiner | 4 |
| Goldfish | 6 |
| Largemouth Bass | 33 |
| Northern Pike | 5 |
| Pumpkinseed | 35 |
| Smallmouth Bass | 1 |

Figure 1: Location of fish sampling sites at Long Point NWA. See Appendix 6 for detailed site descriptions.

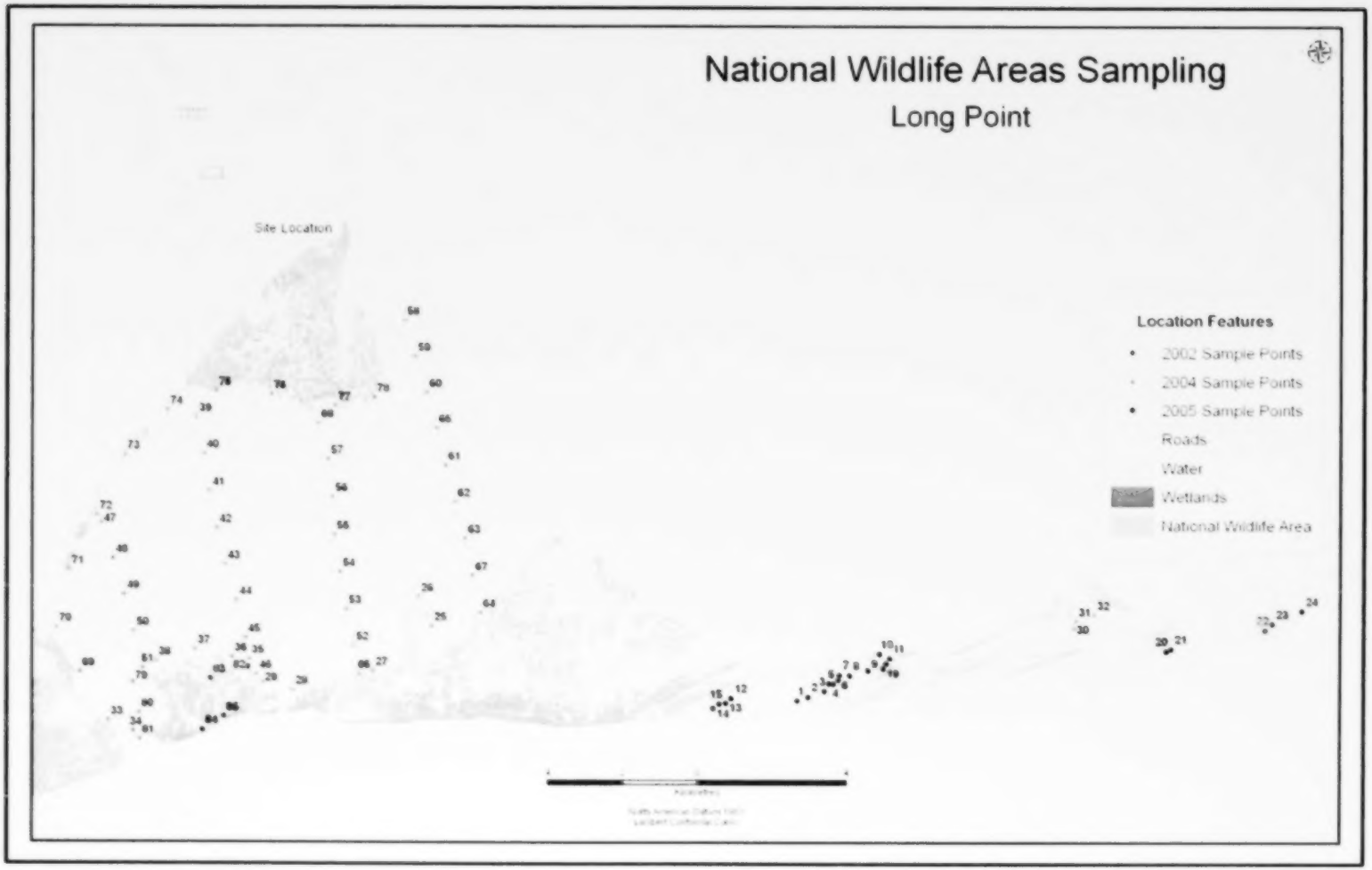


Figure 1: Location of fish sampling sites at Long Point NWA. See Appendix 6 for detailed site descriptions.

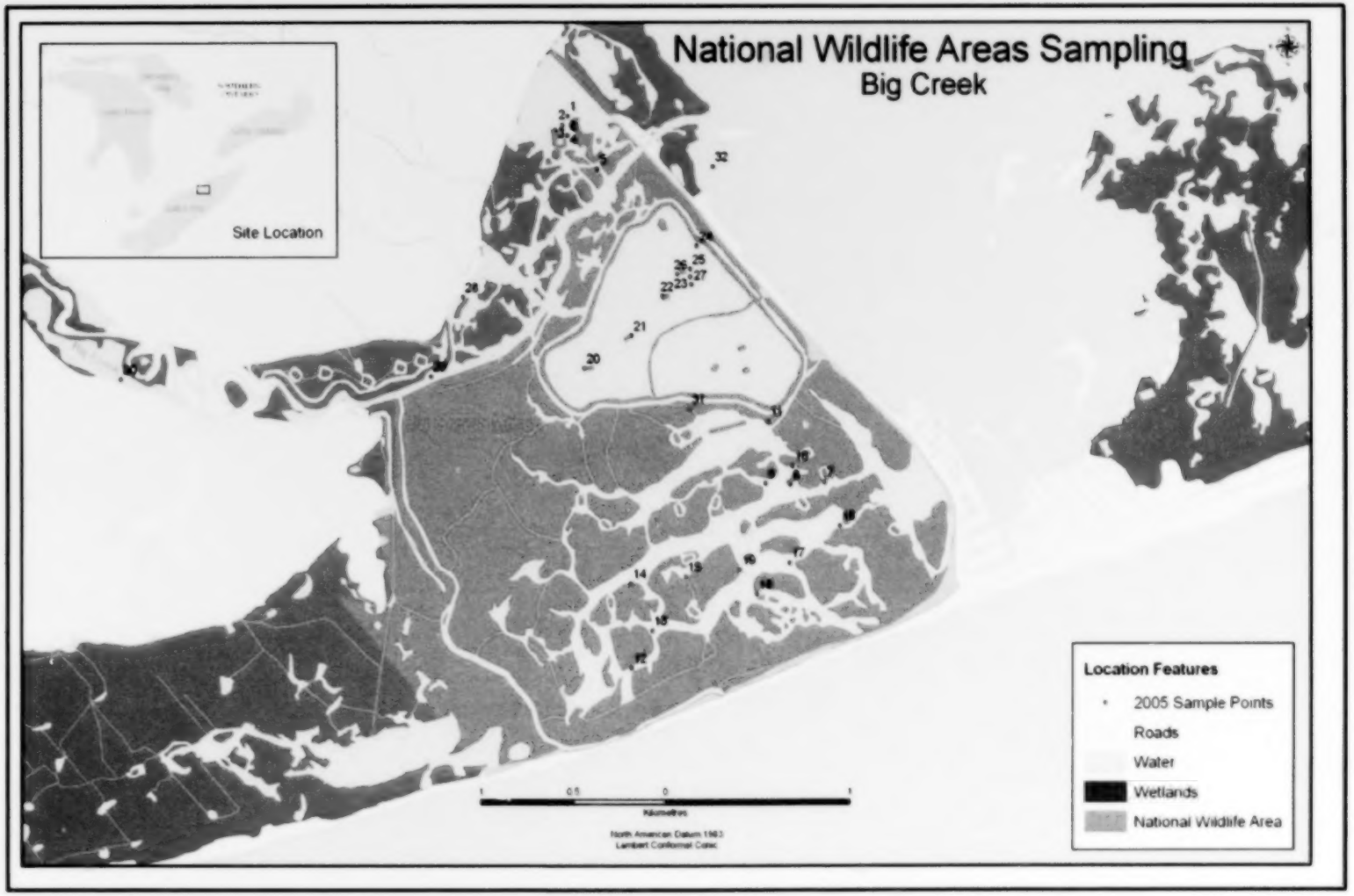


Figure 2: Location of fish sampling sites at Big Creek NWA in 2005. See Appendix 5 for detailed site descriptions.

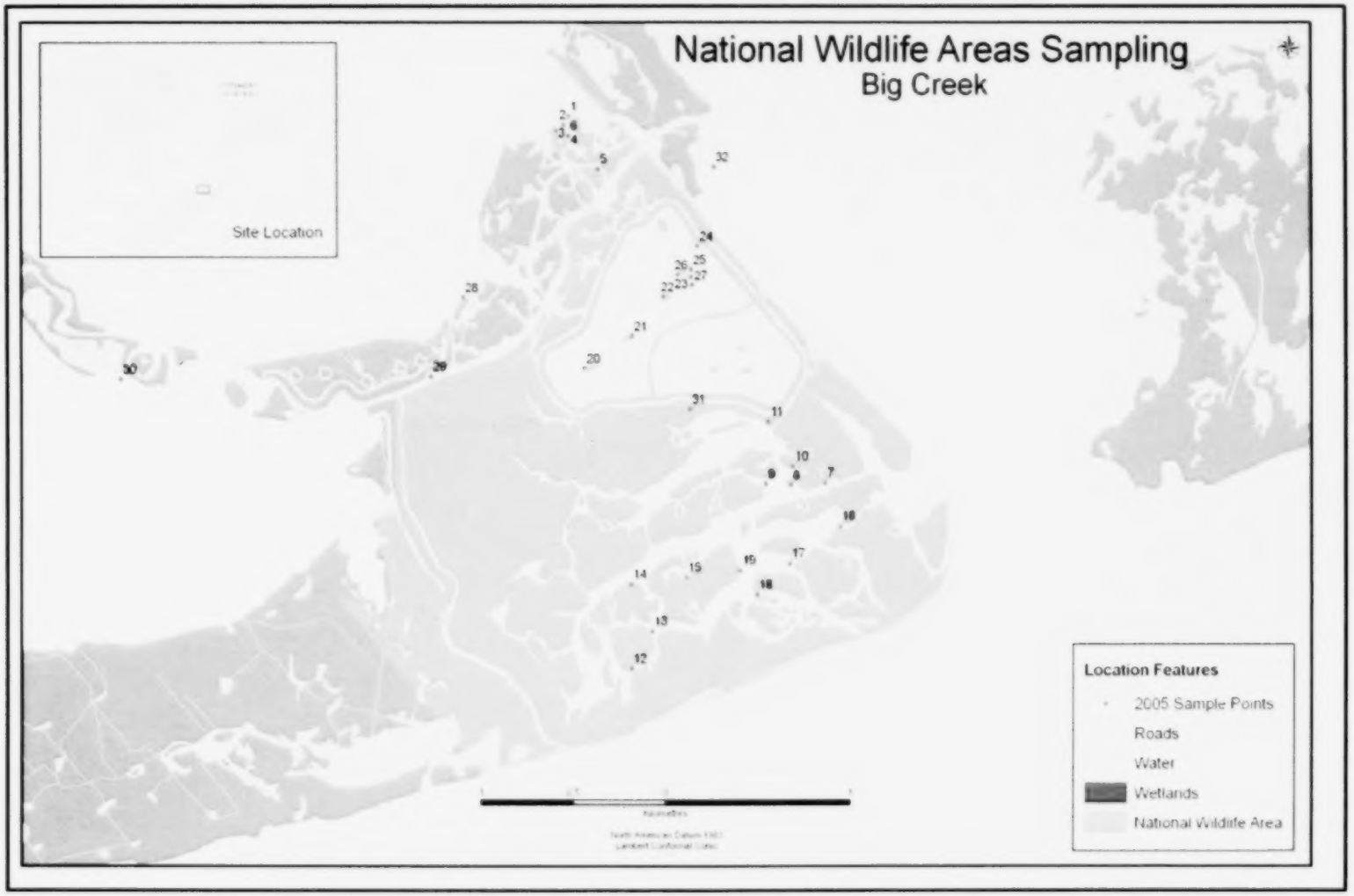


Figure 2: Location of fish sampling sites at Big Creek NWA in 2005. See Appendix 5 for detailed site descriptions.

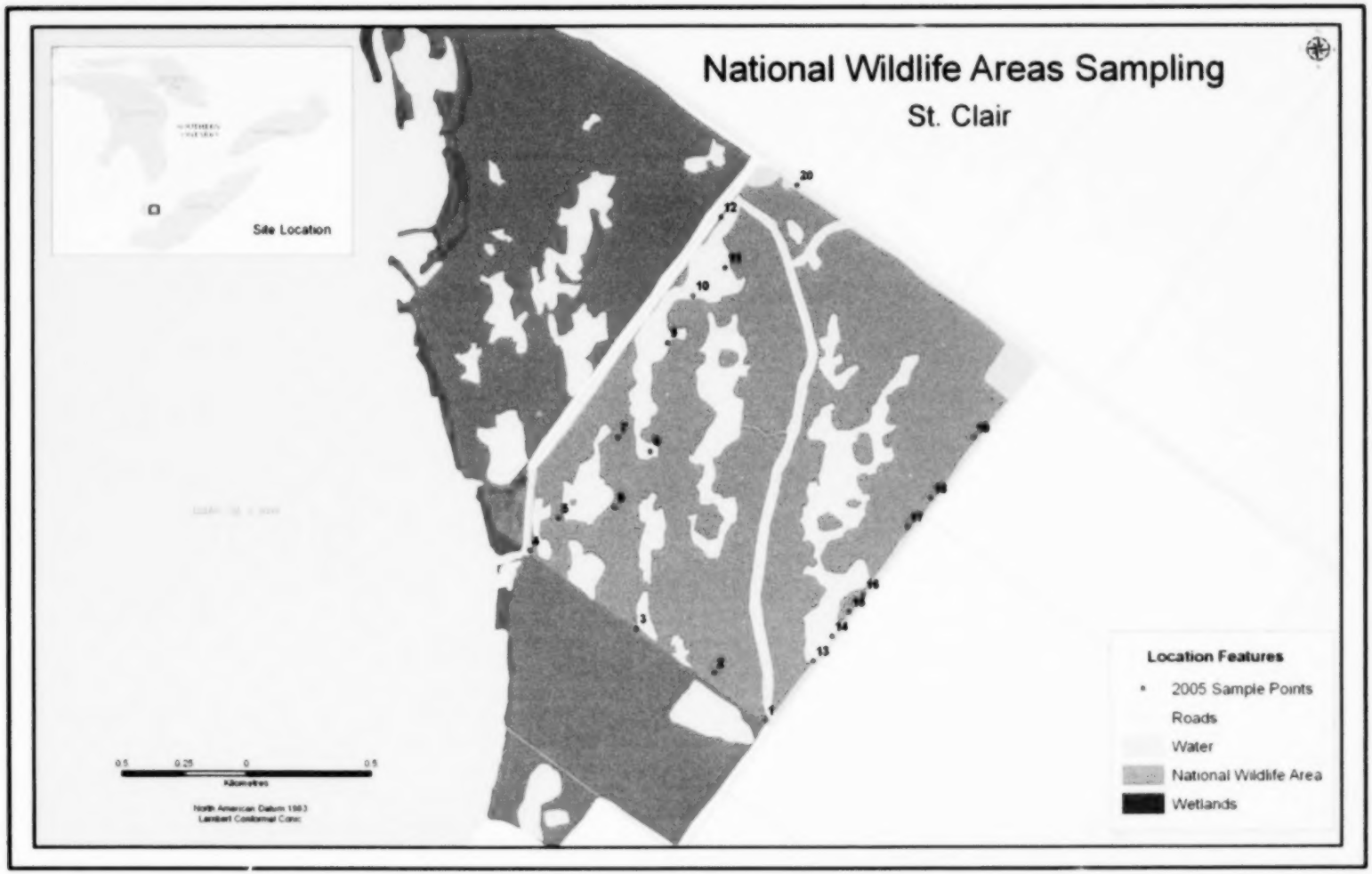


Figure 3: Location of fish sampling sites at St. Clair NWA. See Appendix 7 for detailed site descriptions.

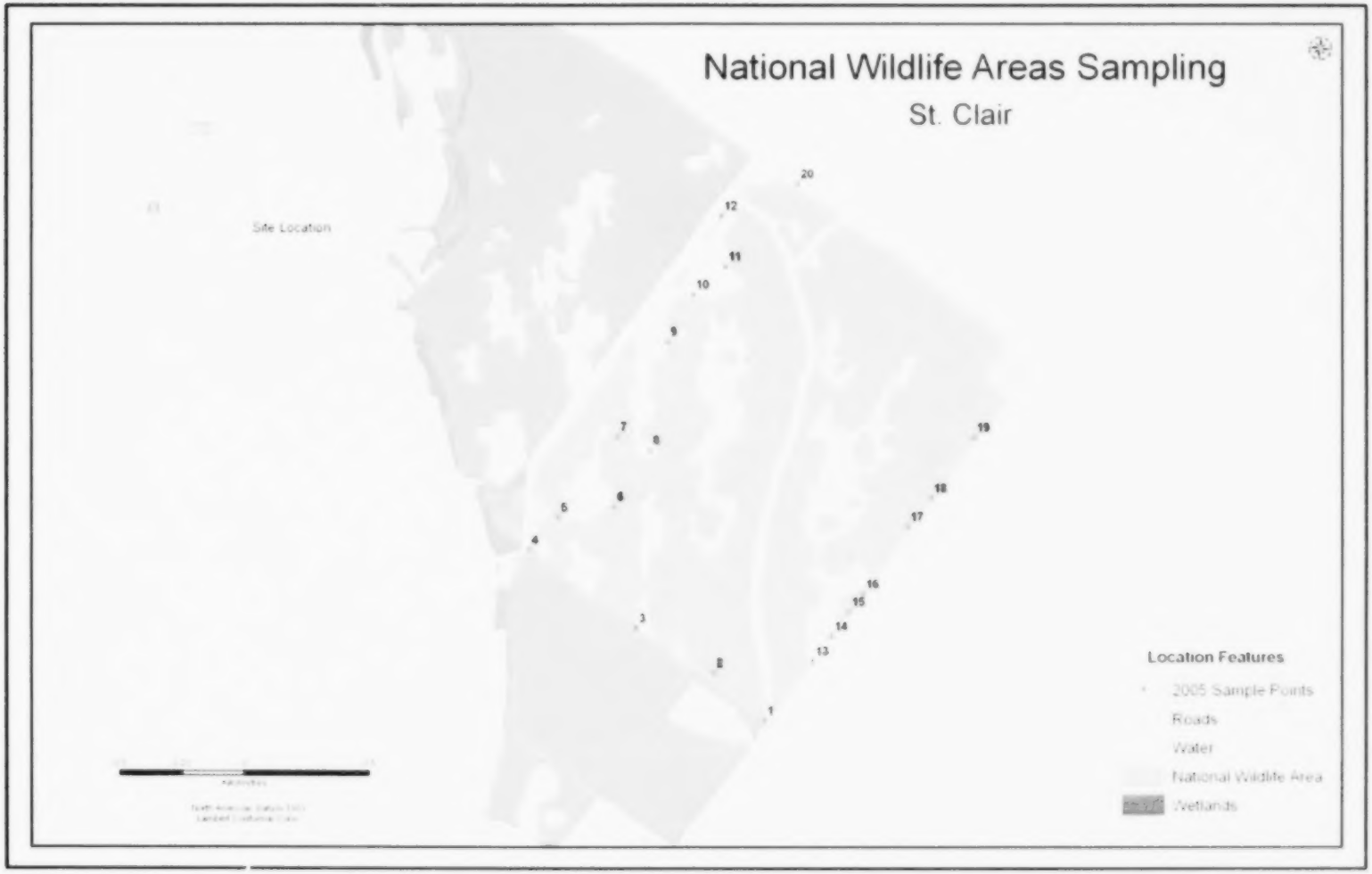


Figure 3: Location of fish sampling sites at St. Clair NWA. See Appendix 7 for detailed site descriptions.

Appendix 1: Common and scientific names of species collected in NWAs, 2002-2005 (according to Nelson et al. 2004).

| Common Name | Scientific Name |
|---|---|
| Alewife | *Alosa pseudoharengus* |
| Banded Killifish | *Fundulus diaphanus* |
| Black Bullhead | *Ameiurus melas* |
| Black Crappie | *Pomoxis nigromaculatus* |
| Blackchin Shiner | *Notropis heterodon* |
| Blacknose Shiner | *Notropis heterolepis* |
| Bluegill | *Lepomis macrochirus* |
| Bluntnose Minnow | *Pimephales notatus* |
| Bowfin | *Amia calva* |
| Brook Silverside | *Labidesthes sicculus* |
| Brown Bullhead | *Ameiurus nebulosus* |
| Central Mudminnow | *Umbra limi* |
| Channel Catfish | *Ictalurus punctatus* |
| Common Carp | *Cyprinus carpio* |
| Emerald Shiner | *Notropis atherinoides* |
| Freshwater Drum | *Aplodinotus grunniens* |
| Gizzard Shad | *Dorosoma cepedianum* |
| Golden Shiner | *Notemigonus crysoleucas* |
| Goldfish | *Carassius auratus* |
| Grass Pickerel | *Esox americanus vermiculatus* |
| Iowa Darter | *Etheostoma exile* |
| Johnny Darter | *Etheostoma nigrum* |
| Lake Chubsucker | *Erimyzon sucetta* |
| Largemouth Bass | *Micropterus salmoides* |
| Logperch | *Percina caprodes* |
| Longnose Gar | *Lepisosteus osseus* |
| Mimic Shiner | *Notropis volucellus* |
| Northern Pike | *Esox lucius* |
| Pugnose Shiner | *Notropis anogenus* |
| Pumpkinseed | *Lepomis gibbosus* |
| Rainbow Trout | *Oncorhynchus mykiss* |
| Rock Bass | *Ambloplites rupestris* |
| Round Goby | *Neogobius melanostomus* |
| Smallmouth Bass | *Micropterus dolomieu* |
| Spotfin Shiner | *Cyprinella spiloptera* |
| Spottail Shiner | *Notropis hudsonius* |
| Tadpole Madtom | *Noturus gyrinus* |
| Warmouth | *Lepomis gulosus* |
| Yellow Bullhead | *Ameiurus natalis* |
| Yellow Perch | *Perca flavescens* |

Appendix 2: Big Creek NWA sampling site habitat data.

| Map # | Air Temp. (°C) | Water Temp. (°C) | Secchi Depth (m) | Max. Depth (m) | Distance From Shore (m) | Aquatic Veg. Type1 | Aquatic Veg. 1 (%) | Aquatic Veg. Type2 | Aquatic Veg. 2 (%) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 22.1 | 23 | 0.546 | 0.73 | 0 | Emergent | 100 | | |
| 2 | 25.2 | 23 | 0.58 | 20 | 0 | Emergent | 100 | | |
| 3 | 25.7 | 23 | 0.735 | 0.73 | 0 | Emergent | 80 | Submergent | 20 |
| 4 | 24.6 | 23 | 0.67 | 1.5 | 0 | Emergent | 80 | Submergent | 20 |
| 5 | 27.7 | 23.5 | 0.65 | 1.5 | 0 | Emergent | 80 | Submergent | 20 |
| 6 | | | | 1.5 | | Emergent | 80 | Submergent | 20 |
| 7 | 22.4 | 25 | 0.704 | 0.5 | 0 | Submergent | 50 | Emergent | 50 |
| 8 | 22.9 | | 0.78 | 0.8 | 0 | Submergent | 50 | Emergent | 50 |
| 9 | 22.9 | 26 | 0.61 | 0.5 | 0 | Emergent | 50 | Submergent | 50 |
| 10 | 23.4 | 27 | 0.612 | 0.5 | | Emergent | 70 | Submergent | 30 |
| 11 | 23 | 25 | 0.69 | 0.6 | 10 | Emergent | 80 | Submergent | 20 |
| 12 | 23.2 | 25 | 1.2+ | 0.51 | 10 | Emergent | 50 | Submergent | 50 |
| 13 | 21.4 | 25.5 | 0.81 | 0.64 | 5 | Emergent | 50 | Submergent | 50 |
| 14 | 26.7 | 26 | 0.71 | 0.56 | 5 | Emergent | 70 | Submergent | 30 |
| 15 | 26.9 | 26 | 0.7 | 0.5 | 5 | Emergent | 65 | Submergent | 35 |
| 16 | 24.6 | 24 | 0.67 | 0.6 | 5 | Emergent | 50 | Submergent | 50 |
| 17 | 25.8 | 24 | | 0.59 | 4 | Emergent | 60 | Submergent | 40 |
| 18 | 26.8 | 25 | 0.8 | 0.65 | 5 | Emergent | 50 | Submergent | 50 |
| 19 | 25.4 | 25.5 | 1.2+ | 0.71 | 5 | Emergent | 50 | Submergent | 50 |
| 20 | 21 | 23 | 0.802 | 0.64 | 5 | Emergent | 40 | Submergent | 60 |
| 21 | 21.6 | 23.5 | 1.2+ | 1.05 | 5 | Emergent | 50 | Submergent | 50 |
| 22 | 21.7 | 26 | 1.2+ | 2+ | 10 | Emergent | 70 | Submergent | 30 |
| 23 | 21.1 | 25 | 0.76 | 2 | 5 | Emergent | 40 | Submergent | 60 |
| 24 | 16.9 | 23.5 | 1.2+ | 0.6 | 5 | Emergent | 50 | Submergent | 50 |
| 25 | 17 | 23.5 | 1.2+ | 0.95 | 2 | Emergent | 50 | Submergent | 50 |

Appendix 2: Continued

| Map # | Air Temp. (°C) | Water Temp. (°C) | Secchi Depth (m) | Max. Depth (m) | Distance From Shore (m) | Aquatic Veg. Type1 | Aquatic Veg. 1 (%) | Aquatic Veg. Type2 | Aquatic Veg. 2 (%) |
|---|---|---|---|---|---|---|---|---|---|
| **26** | 16.4 | 24 | 1.2+ | 0.82 | 5 | Emergent | 60 | Submergent | 40 |
| **27** | 19.4 | 24 | 1.2+ | 0.7 | 0 | Emergent | 40 | Submergent | 60 |
| **28** | 0 | 0 | | | | | 0 | | 0 |
| **29** | 0 | 0 | | | | | 0 | | 0 |
| **30** | 28 | 0 | | | | | 0 | | 0 |
| **31** | 25 | 19 | | | | | 0 | | 0 |
| **32** | 0 | 0 | | | | | 0 | | 0 |

Appendix 3: St. Clair NWA sampling site habitat data.

| Map # | Air Temp. (°C) | Water Temp. (°C) | Secchi Depth (m) | Max. Depth (m) | Distance From Shore (m) | Aquatic Veg. Type 1 | Aquatic Veg. 1 (%) | Aquatic Veg. Type 2 | Aquatic Veg. 2 (%) | Aquatic Veg. Type 3 | Aquatic Veg. 3 (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 21.9 | 20.7 | 1.2+ | 0.79 | 5 | Emergent | 50 | Submergent | 50 | | |
| **2** | 21.7 | 21.6 | 1.2+ | 0.69 | 6 | Emergent | 60 | Submergent | 40 | | |
| **3** | 21.8 | 21.9 | 1.2+ | 0.81 | 0 | Emergent | 60 | Submergent | 40 | | |
| **4** | 22 | 21.8 | 1.2+ | 0.78 | 0 | Emergent | 80 | Submergent | 20 | | |
| **5** | 24.5 | 22.1 | 1.2+ | 0.7 | 0 | Emergent | 65 | Submergent | 35 | | |
| **6** | 24.5 | 22.8 | 1.2+ | 0.71 | 0 | Emergent | 70 | Submergent | 30 | | |
| **7** | 25.4 | 22.4 | 1.2+ | 0.68 | 0 | Emergent | 60 | Submergent | 40 | | |
| **8** | 26.7 | 22.5 | 1.2+ | 0.72 | 0 | Emergent | 60 | Submergent | 40 | | |
| **9** | 21.2 | 21.9 | 1.2+ | 0.7 | 8 | Emergent | 60 | Submergent | 40 | | |
| **10** | 24.6 | 21.6 | | 0.7 | 12 | Emergent | 50 | Submergent | 50 | | |
| **11** | 25 | 22.3 | 1.2+ | 0.7 | 5 | Emergent | 40 | Submergent | 60 | | |
| **12** | 25.7 | 23 | 1.2+ | 0.8 | 5 | | | | | | |
| **13** | 21.1 | 24 | 0.80 | 0.6 | 0 | None | 30 | Floating | 10 | Submergent | 60 |
| **14** | 25.9 | 25.1 | 0.41 | 0.6 | 0 | None | 60 | Submergent | 40 | | |
| **15** | 26.3 | 24.9 | 1.05 | 0.6 | 0 | Floating | 20 | None | 30 | Submergent | 50 |
| **16** | 24.9 | 26.3 | 1.15 | 0.4 | 0 | None | 30 | Emergent | 20 | Submergent | 50 |
| **17** | 25 | 24.5 | 1.2+ | 0.71 | 0 | None | 60 | Floating | 10 | Submergent | 30 |
| **18** | 26.7 | 25.7 | 1.2+ | 0.69 | 0 | None | 50 | Floating | 5 | Submergent | 45 |
| **19** | 27.2 | 25.4 | 1.2+ | 0.7 | 0 | Floating | 30 | Submergent | 70 | | |
| **20** | 26.5 | 26.1 | | 1 | 0 | Floating | 10 | Submergent | 40 | Emergent | 50 |

Appendix 4: Long Point NWA sampling site habitat data.

| Map # | Air Temp. (°C) | Water Temp. (°C) | Secchi Depth (m) | Max. Depth (m) | Distance From Shore (m) | Aquatic Veg. Type 1 | Aquatic Veg. 1 (%) | Aquatic Veg. Type 2 | Aquatic Veg. 2 (%) |
|---|---|---|---|---|---|---|---|---|---|
| **1** | 18.4 | 23 | 1.2+ | 0.6 | 5 | Emergent | 60 | Submergent | 40 |
| **2** | 18.6 | 23 | 1.2+ | 0.65 | 20 | Emergent | 70 | Submergent | 30 |
| **3** | 18.8 | 23 | 1.2+ | 1 | 15 | Emergent | 60 | Submergent | 40 |
| **4** | 18.4 | 23 | 1.2+ | 1 | 10 | Emergent | 60 | Submergent | 40 |
| **5** | 19.6 | 23 | 1.2+ | 0.69 | 10 | Emergent | 40 | Submergent | 60 |
| **6** | 23.5 | 24 | 1.2+ | 0.6 | 50 | Emergent | 70 | Submergent | 30 |
| **7** | 23.8 | 24 | 1.2+ | 0.66 | 10 | Emergent | 90 | Submergent | 10 |
| **8** | 21.1 | 23 | 1.2+ | 0.5 | 0 | Emergent | 60 | Submergent | 40 |
| **9** | 23.6 | 24.5 | 1.2+ | 0.65 | 10 | Emergent | 60 | Submergent | 40 |
| **10** | 22.6 | 24.5 | 1.2+ | 0.69 | 10 | Emergent | 80 | Submergent | 20 |
| **11** | 22.6 | 24.5 | 1.2+ | 0.59 | 10 | Emergent | 60 | Submergent | 40 |
| **12** | 27 | 29 | 0.835 | 0.87 | 0 | Emergent | 50 | Submergent | 50 |
| **13** | 27.1 | 29 | 1.2+ | 0.81 | 0 | Emergent | 60 | Submergent | 40 |
| **14** | 22.1 | 29 | 1.2+ | 0.69 | 0 | Emergent | 50 | Submergent | 50 |
| **15** | 26.2 | 29 | 1.2+ |  | 0 | Emergent | 70 | Submergent | 30 |
| **16** | 26.9 | 26.5 | 1.2+ | 0.58 | 2 | Emergent | 100 |  |  |
| **17** | 27 | 26.5 | 1.2+ | 0.56 | 3 | Emergent | 70 | Submergent | 30 |
| **18** | 27.5 | 26.5 | 1.2+ | 0.71 | 1 | Emergent | 80 | Submergent | 20 |
| **19** | 27.5 | 26.5 | 1.2+ | 0.68 | 2 | Emergent | 60 | Submergent | 40 |
| **20** | 30 | 28 | 1.2+ | 1.25 | 0 | Emergent | 50 | Submergent | 50 |
| **21** | 30 | 28 | 1.2+ | 1.5 | 0 | Emergent | 50 | Submergent | 50 |
| **22** | 29 | 29 | 1.2+ | 0.5 | 5 | Emergent | 60 | Submergent | 40 |
| **23** | 29 | 29 | 1.2+ | 0.5 | 5 | Emergent | 100 |  |  |
| **24** | 27.2 | 29 | 1.2+ | 0.6 | 5 | Submergent | 40 | Emergent | 60 |
| **25** | 0 | 0 | 1.10 | 1.1 | 10 | Emergent | 50 | Submergent | 50 |

Appendix 4: Continued

| Map # | Air Temp. (°C) | Water Temp. (°C) | Secchi Depth (m) | Max. Depth (m) | Distance From Shore (m) | Aquatic Veg. Type 1 | Aquatic Veg. 1 (%) | Aquatic Veg. Type 2 | Aquatic Veg. 2 (%) | Aquatic Veg. Type 3 | Aquatic Veg. 3 (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **26** | 0 | 0 | 1.08 | 1.08 | 10 | Emergent | 80 | None | 20 | | 0 |
| **27** | 0 | 0 | 2 | 2 | 10 | Emergent | 50 | Submergent | 50 | | 0 |
| **28** | 0 | 0 | 0.9 | 0.9 | 100 | Submergent | 40 | Emergent | 40 | None | 20 |
| **29** | 0 | 0 | 1.0 | 1 | 30 | Emergent | 40 | Submergent | 60 | | 0 |
| **30** | 23.9 | 25.6 | 0.92 | 0.92 | 10 | Emergent | 50 | Submergent | 50 | | 0 |
| **31** | 0 | 0 | 0.95 | 0.95 | 100 | Typha | 30 | Chara | 50 | Zizania | 20 |
| **32** | 25.6 | 26.2 | 1.03 | 1.03 | | Emergent | 70 | Submergent | 20 | None | 10 |
| **33** | 21 | 23 | 0.80 | 0.75 | 20 | Submergent | 80 | Floating | 20 | | 0 |
| **34** | 25.1 | 23.5 | 1.38 | 1.38 | 150 | Emergent | 50 | Submergent | 50 | | 0 |
| **35** | 0 | 0 | | 1.25 | 5 | Emergent | 40 | Submergent | 20 | None | 40 |
| **36** | 22 | 18 | >1.25 | | 200 | Emergent | 60 | Submergent | 40 | | 0 |
| **37** | 22 | 18 | >1.25 | | 300 | Zizania | 50 | Submergent | 50 | | 0 |
| **38** | 24 | 18 | >1.25 | | 500 | Zizania | 50 | Submergent | 50 | | 0 |
| **39** | 20.3 | 23.5 | 2.15 | 2.15 | 500 | Submergent | 100 | | 0 | | 0 |
| **40** | 19.2 | 23.1 | 1.88 | 1.88 | 1000 | Submergent | 80 | None | 20 | | 0 |
| **41** | 20.7 | 22.8 | 1.72 | 2.2 | | None | 100 | | 0 | | 0 |
| **42** | 20.2 | 22.6 | 2.35 | 2.35 | | None | 100 | | 0 | | 0 |
| **43** | 20.7 | 22.7 | 2.18 | 2.18 | 2500 | None | 100 | | 0 | | 0 |
| **44** | 19.3 | 22.3 | 2.11 | 2.11 | 3000 | None | 100 | | 0 | | 0 |
| **45** | 20.1 | 22.6 | 1.68 | 1.68 | 2000 | None | 100 | | 0 | | 0 |
| **46** | 20.4 | 22.7 | 0.92 | 0.92 | 500 | Chara | 80 | Vallisneria | 20 | | 0 |
| **47** | 22.5 | 23.1 | 1.95 | 1.95 | 280 | Myriophylum | 80 | None | 20 | | 0 |
| **48** | 21.3 | 22.9 | 2.3 | 2.3 | 1300 | Myriophylum | 100 | | 0 | | 0 |
| **49** | 20.7 | 22.8 | 1.97 | 1.97 | 2500 | Myriophylum | 60 | None | 40 | | 0 |
| **50** | 21.7 | 22.9 | 0.86 | 2.27 | 2000 | None | 100 | | 0 | | 0 |

Appendix 4: Continued

| Map # | Air Temp. (°C) | Water Temp. (°C) | Secchi Depth (m) | Max. Depth (m) | Distance from Shore (m) | Aquatic Veg. Type 1 | Aquatic Veg. 1 (%) | Aquatic Veg. Type 2 | Aquatic Veg. 2 (%) | Aquatic Veg. Type 3 | Aquatic Veg. 3 (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **51** | 21.5 | 22.7 | 0.98 | 1.24 | 1000 | None | 100 | | 0 | | 0 |
| **52** | 21.7 | 22.1 | 1.65 | 1.65 | | None | 100 | | 0 | | 0 |
| **53** | 21.7 | 22.4 | 1.95 | 1.95 | | Submergent | 10 | None | 90 | | 0 |
| **54** | 21.1 | 21.8 | 2.56 | 3.1 | | None | 100 | | 0 | | 0 |
| **55** | 20.5 | 21.4 | 2.48 | 2.48 | | None | 100 | | 0 | | 0 |
| **56** | 20.8 | 21.9 | 2.35 | 2.35 | | None | 100 | | 0 | | 0 |
| **57** | 20.8 | 22.1 | 1.95 | 1.95 | | None | 100 | | 0 | | 0 |
| **58** | 20.3 | 20.4 | 3.8 | 3.8 | | None | 100 | | 0 | | 0 |
| **59** | 20.4 | 19.1 | 2.92 | 3.28 | | None | 100 | | 0 | | 0 |
| **60** | 20.4 | 20 | 2.95 | 3.4 | | None | 100 | | 0 | | 0 |
| **61** | 20.6 | 20.5 | 3.22 | 3.22 | | None | 100 | | 0 | | 0 |
| **62** | 20.7 | 21.3 | 2.95 | 2.95 | | None | 100 | | 0 | | 0 |
| **63** | 21.4 | 22.4 | 2.08 | 2.08 | | None | 100 | | 0 | | 0 |
| **64** | 21.3 | 22.5 | 0.85 | 0.85 | | Emergent | 40 | None | 60 | | 0 |
| **65** | 20.5 | 19.9 | 2.95 | 3.54 | | None | 100 | | 0 | | 0 |
| **66** | 22.7 | 22.8 | 0.55 | 0.55 | | Emergent | 50 | Submergent | 50 | | 0 |
| **67** | 21.4 | 22.5 | 1.72 | 1.72 | | None | 100 | | 0 | | 0 |
| **68** | 21.7 | 22.8 | 1.85 | 1.85 | 500 | Submergent | 40 | None | 60 | | 0 |
| **69** | 23.7 | 21.4 | 0.59 | 1.1 | 10 | Emergent | 25 | Submergent | 25 | None | 50 |
| **70** | 17.2 | 21.8 | 1.4 | 1.6 | 50 | Myriophylum | 50 | None | 50 | | 0 |
| **71** | 16.2 | 22.4 | 0.94 | 1 | 50 | Myriophylum | 50 | None | 50 | | 0 |
| **72** | 17.2 | 22.9 | 1.95 | 1.95 | 60 | Myriophylum | 50 | Zizania | 10 | None | 40 |
| **73** | 18.2 | 22.9 | 1.19 | 1.2 | 20 | Submergent | 40 | None | 60 | | 0 |
| **74** | 18.2 | 23.2 | 1.16 | 1.5 | 20 | Myriophylum | 50 | None | 50 | | 0 |

Appendix 4: Continued

| Map # | Air Temp. (°C) | Water Temp. (°C) | Secchi Depth (m) | Max. Depth (m) | Distance from Shore (m) | Aquatic Veg. Type 1 | Aquatic Veg. 1 (%) | Aquatic Veg. Type 2 | Aquatic Veg. 2 (%) | Aquatic Veg. Type 3 | Aquatic Veg. 3 (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **75** | 18.1 | 22.6 | 0.80 | 1 | 25 | Myriophylum | 20 | Emergent | 20 | None | 60 |
| **76** | 16.4 | 22.4 | 0.73 | 1 | 20 | Emergent | 50 | None | 50 | | 0 |
| **77** | 17.9 | 22.4 | 0.95 | 1.5 | 10 | Submergent | 20 | Emergent | 20 | None | 60 |
| **78** | 18.2 | 22.7 | 1.4 | 1..5 | 20 | Emergent | 50 | Submergent | 10 | None | 40 |
| **79** | 18 | 19 | >1.2 | | 1000 | Submergent | 50 | Zizania | 50 | | 0 |
| **80** | 18 | 19 | >1.2 | | 1000 | Chara | 50 | Zizania | 50 | | 0 |
| **81** | 20 | 19 | >1 | | 250 | Emergent | 50 | Submergent | 25 | Floating | 25 |
| **82** | 25 | 21 | | | | | 0 | | 0 | | 0 |
| **83** | 0 | 0 | | | | | 0 | | 0 | | 0 |
| **84** | 23 | 28 | | | | | 0 | | 0 | | 0 |
| **85** | 28 | 22 | | | | | 0 | | 0 | | 0 |

Appendix 5: Locality descriptions of the Big Creek NWA sites.

| Map # | Field Number | Date | Locality | Latitude | Longitude |
|---|---|---|---|---|---|
| 1 | BGCK05060705001 | 06/06/2005 | East end of North Pond | 42.60376358 | -80.45822144 |
| 2 | BGCK05060705002 | 06/06/2005 | Centre of North Pond | 42.60343552 | -80.45866394 |
| 3 | BGCK05060705003 | 07/06/2005 | West end of North Pond | 42.60326767 | -80.45921326 |
| 4 | BGCK05060705004 | 07/06/2005 | East bank of north channel | 42.60290146 | -80.45854187 |
| 5 | BGCK05060705005 | 07/06/2005 | North channel, 50 m from Big Creek main channel | 42.6010704 | -80.45716858 |
| 6 | BGCK05060705006 | 07/06/2005 | Same site as 004 | 42.60290146 | -80.45854187 |
| 7 | BGCK05060805007 | 08/06/2005 | East end of central pond | 42.58456421 | -80.44756317 |
| 8 | BGCK05060805008 | 08/06/2005 | | 42.58485031 | -80.44975281 |
| 9 | BGCK05060805009 | 08/06/2005 | North bank of central pond | 42.58518219 | -80.45126343 |
| 10 | BGCK05060805010 | 08/06/2005 | East side of middle pond, adjacent to channel from North Pond | 42.5856514 | -80.44933319 |
| 11 | BGCK05060805011 | 08/06/2005 | Easternmost point of North Pond, about 15 m on the right after opening from channel (from NWA dock) to North Pond | 42.587883 | -80.45019531 |
| 12 | BGCK05060905012 | 09/06/2005 | Saw Log Pond, north shore, west end | 42.57841492 | -80.4623642 |
| 13 | BGCK05060905013 | 09/06/2005 | East end of Saw Log Pond | 42.57881546 | -80.46053314 |
| 14 | BGCK05060905014 | 09/06/2005 | Left side of middle pond coming from Saw Log Pond ~ 20 m from channel (from Saw Log Pond) on south bank | 42.58221817 | -80.46117401 |
| 15 | BGCK05060905015 | 09/06/2005 | Top of Benson's Pond, on south shore | 42.58192062 | -80.45763397 |
| 16 | BGCK05061405016 | 14/06/2005 | Bottom of South Pond (East) | 42.58246613 | -80.44725037 |
| 17 | BGCK05061405017 | 14/06/2005 | Middle portion of South Pond | 42.58138657 | -80.45093536 |
| 18 | BGCK05061405018 | 14/06/2005 | Top of South Pond near channel to Benson's | 42.58033752 | -80.45345306 |
| 19 | BGCK05061405019 | 14/06/2005 | Top of South Pond near channel to Benson's Pond, directly opposite of previous site (018) | 42.58161545 | -80.45412445 |
| 20 | BGCK05061505020 | 15/06/2005 | | 42.59226227 | -80.46091461 |
| 21 | BGCK05061505021 | 15/06/2005 | | 42.59319687 | -80.45749664 |
| 22 | BGCK05061505022 | 15/06/2005 | North impoundment | 42.59461594 | -80.45497894 |
| 23 | BGCK05061505023 | 15/06/2005 | North impoundment, across from first island up from observation deck | 42.59518051 | -80.45297241 |

Appendix 5: Continued

| Map # | Field Number | Date | Locality | Latitude | Longitude |
|---|---|---|---|---|---|
| 24 | BGCK05061605024 | 16/06/2005 | North impoundment directly across from 1st island ~ 200 m up channel from observation tower | 42.59649658 | -80.45210266 |
| 25 | BGCK0506160525 | 16/06/2005 | North impoundment directly across from north side of 1st island ~ 200 m down channel from observation tower | 42.59553146 | -80.45285797 |
| 26 | BGCK05061605026 | 16/06/2005 | North impoundment ~ 200 m upstream/up-channel from bird observation tower on far side of 1st island | 42.5954361 | -80.45373535 |
| 27 | BGCK05061605027 | 16/06/2005 | First indent on left side when coming out of channel from launch at bird sanctuary. In north impoundment, just before 1st island | 42.59481812 | -80.4529953 |
| 28 | SPGR02-BCMR-001 | 18/06/2002 | Big Creek Delta | 42.59680176 | -80.46749115 |
| 29 | SPGR02-BCMR-002 | 18/06/2002 | Encroaching the main Big Creek Channel | 42.5936203 | -80.47064972 |
| 30 | SPGR02-BCMR-003 | 18/06/2002 | Upstream Of Port Royal Bridge | 42.59693909 | -80.49005127 |
| 31 | SPGR02-BCMR-004 | 18/06/2002 | Southern portion of marsh | 42.58930969 | -80.45493317 |
| 32 | SPGR02-BCMR-005 | 18/06/2002 | Big Creek Delta | 42.59986877 | -80.44989777 |

Appendix 6: Locality description of the Long Point NWA sites sampled.

| Map # | Field Number | Date | Locality | Latitude | Longitude |
|---|---|---|---|---|---|
| 1 | LP05062205001 | 22/06/2005 | Western end of Bouck's Pond | 42.55578232 | -80.22904968 |
| 2 | LP05062205002 | 22/06/2005 | Western end of Bouck's Pond, approximately 200 m up the channel from Site 1 | 42.55606842 | -80.22538757 |
| 3 | LP05062205003 | 22/06/2005 | Western end of Bouck's Pond on south side of channel, ~200 m east of Site 2 | 42.55648041 | -80.21985626 |
| 4 | LP05062205004 | 22/06/2005 | Centre of Bouck's Pond ~150 m up the channel from Site 3 on north side | 42.55800247 | -80.21794891 |
| 5 | LP05062305005 | 23/06/2005 | Midpoint of Bouck's Pond | 42.55776596 | -80.21653748 |
| 6 | LP05062305006 | 23/06/2005 | Middle of Bouck's Pond ~200 m east of Site 5 | 42.55836487 | -80.21478271 |
| 7 | LP05062305007 | 23/06/2005 | Middle of Bouck's Pond ~250 m from Site 6 | 42.55941772 | -80.21392822 |
| 8 | LP05062305008 | 23/06/2005 | Middle of Bouck's Pond ~ 500 m across the pond from Site 7 | 42.55868149 | -80.21086121 |
| 9 | LP05062405009 | 24/06/2005 | Middle of Bouck's Pond ~ 200 m up the channel from Site 7, on south side | 42.558918 | -80.2048645 |
| 10 | LP05062405010 | 24/06/2005 | East end of Bouck's Pond ~ 500 m from opening to Erie, on north side of channel | 42.56204987 | -80.20010376 |
| 11 | LP05062405011 | 24/06/2005 | East end of Bouck's Pond- by entrance on south side | 42.56044769 | -80.19723511 |
| 12 | LP05062805012 | 28/06/2005 | Squire's Ridge Pond ~ 3 km W of Squire's Ridge Cottage, just off of ATV trail | 42.56003571 | -80.24923706 |
| 13 | LP05062805013 | 28/06/2005 | Squire's Ridge Pond – 3 km west of Squire's Ridge Cottage, just off of ATV trail | 42.55916595 | -80.25118256 |
| 14 | LP05062805014 | 28/06/2005 | Approx. 3 km west of Squire's Ridge Cottage | 42.55875015 | -80.25549316 |
| 15 | LP05062805015 | 28/06/2005 | Approx. 3 km west of Squire's Ridge Cottage | 42.55934906 | -80.2532959 |
| 16 | LP05062905016 | 29/06/2005 | Narrow channel joining Little Creek and Bouck's Pond approximately 250 m in from the mouth of Bouck's Pond on south side at the entrance of Little Pond | 42.55958557 | -80.19841766 |
| 17 | LP05062905017 | 29/06/2005 | 20 m east of mouth of channel joining Bouck's Pond to Little Creek (90 m east of Site 16) | 42.55939865 | -80.19838715 |
| 18 | LP05062905018 | 29/06/2005 | South side of Little Creek approximately 20 m west of channel | 42.55938721 | -80.19881439 |

Appendix 6: Continued

| Map # | Field Number | Date | Locality | Latitude | Longitude |
|---|---|---|---|---|---|
| 19 | LP05062905019 | 29/06/2005 | South side of Little Creek, approximately 50 m down from channel opening from Bouck's Pond to Little Creek | 42.55854797 | -80.19995117 |
| 20 | LP05063005020 | 30/06/2005 | Just off Gravely Bay Road, by Otter Ridge sign, approximately 30 m west on walking trail. Accessed at canoe launch - at far west side of pond | 42.54668427 | -80.11128998 |
| 21 | LP05063005021 | 30/06/2005 | Pond is just off Gravely Bay Road – 30 m west off of trail on walking path, fyke net set at easternmost end of pond | 42.54696274 | -80.1096344 |
| 22 | LP05063005022 | 30/06/2005 | West end of Long Pond | 42.54611969 | -80.0792923 |
| 23 | LP05063005023 | 30/06/2005 | Northwest end of Long Pond | 42.54708481 | -80.07654572 |
| 24 | LP05063005024 | 30/06/2005 | East end of Long Pond | 42.54841232 | -80.06635284 |
| 25 | LPBCOA04BE130704001 | 13/07/2004 | Big Rice Bay, outside Long Point Company property | 42.59352112 | -80.33605194 |
| 26 | LPBCOA04BE130704002 | 13/07/2004 | | 42.6009407 | -80.33792114 |
| 27 | LPBCOA04BE130704003 | 13/07/2004 | Little Rice Bay, Long Point Bay | 42.58626175 | -80.35758972 |
| 28 | LPBCC J4BE130704004 | 13/07/2004 | South shore of Sturgeon Bay; Long Point Bay - Inner Bay | 42.58626938 | -80.38372803 |
| 29 | LPBC A04BE130704005 | 13/07/2004 | Long Point Bay; south shore of Inner Bay; near Old Cut | 42.58969879 | -80.39250183 |
| 30 | LPBCOA04BE140704006 | 14/07/2004 | Bluffs Pond, South Shore | 42.55727005 | -80.13813019 |
| 31 | LPBCOA04BE140704007 | 14/07/2004 | Bluffs Pond; Long Point Bay | 42.55878067 | -80.13693237 |
| 32 | LPBCOA04BE140704008 | 14/07/2004 | Bluffs Pond; Long Point Bay | 42.5592804 | -80.13072205 |
| 33 | LPBCOA04BE160704009 | 16/07/2004 | North of Sandbay Marina | 42.58917999 | -80.44304657 |
| 34 | LPBCOA04BE160704010 | 16/07/2004 | Southeast of Sandbay Marina; edge of wild rice bed | 42.58541107 | -80.43618011 |
| 35 | LPBCOA04BE290804011 | 29/08/2004 | Long Point Bay; west of Old Cut Marina | 42.5958786 | -80.39491272 |
| 36 | LPBCOA04BE290804012 | 29/08/2004 | West of Old Cut Marina | 42.597229 | -80.40003967 |
| 37 | LPBCOA04BE290804013 | 29/08/2004 | West of Old Cut Marina | 42.60108948 | -80.41088104 |
| 38 | LPBCOA04BE290804014 | 29/08/2004 | West of Old Cut; east of Sandbay -> south shore | 42.60052872 | -80.42373657 |
| 39 | LPBHS04BE060704T002H | 06/07/2004 | Transect 2, point H | 42.65481186 | -80.39302826 |

Appendix 6: Continued

| Map # | Field Number | Date | Locality | Latitude | Longitude |
|---|---|---|---|---|---|
| 40 | LPBHS04BE060704T002G | 06/07/2004 | Transect 2, point G | 42.64585114 | -80.39351654 |
| 41 | LPBHS04BE060704T002F | 06/07/2004 | Transect 2, point F | 42.63690948 | -80.39447784 |
| 42 | LPBHS04BE060704T002E | 06/07/2004 | Transect 2, point E | 42.62794876 | -80.39510345 |
| 43 | LPBHS04BE060704T002D | 06/07/2004 | Transect 2, point D | 42.61899185 | -80.39530182 |
| 44 | LPBHS04BE060704T002C | 06/07/2004 | Transect 2, point C | 42.61006927 | -80.39433289 |
| 45 | LPBHS04BE060704T002B | 06/07/2004 | Transect 2, point B | 42.60100937 | -80.3944397 |
| 46 | LPBHS04BE060704T002A | 06/07/2004 | Transect 2, point A | 42.59191895 | -80.39375305 |
| 47 | LPBHS04BE060704T001A | 06/07/2004 | | 42.63552856 | -80.43029785 |
| 48 | LPBHS04BE060704T001B | 06/07/2004 | Long Point Bay - Transect 1, Point 2 | 42.62656021 | -80.42935944 |
| 49 | LPBHS04BE060704T001C | 06/07/2004 | LPBHS04 Transect 1, Point C | 42.61759186 | -80.4286499 |
| 50 | LPBHS04BE060704T001D | 06/07/2004 | Transect 1, Point D | 42.60858154 | -80.42841339 |
| 51 | LPBHS04BE060704T001E | 06/07/2004 | Transect 01, Point E | 42.59955978 | -80.42849731 |
| 52 | LPBHS04BE070704T003G | 07/07/2004 | Transect 3, Point G | 42.59320831 | -80.3615799 |
| 53 | LPBHS04BE070704T003F | 07/07/2004 | Transect 3, Point F | 42.60211945 | -80.36115265 |
| 54 | LPBHS04BE070704T003E | 07/07/2004 | Transect 3, Point E | 42.61104965 | -80.36029816 |
| 55 | LPBHS04BE070704T003D | 07/07/2004 | Transect 3, Point D | 42.6199913 | -80.35926056 |
| 56 | LPBHS04BE070704T003C | 07/07/2004 | Transect 3, Point C | 42.62879181 | -80.35697937 |
| 57 | LPBHS04BE070704T003B | 07/07/2004 | Transect 3, Point B | 42.63769913 | -80.35546112 |
| 58 | LPBHS04BE070704T004I | 07/07/2004 | Transect 4, Point I | 42.66569138 | -80.3214798 |
| 59 | LPBHS04BE070704T004H | 07/07/2004 | Transect 4, Point H | 42.65679169 | -80.32083893 |
| 60 | LPBHS04BE070704T004G | 07/07/2004 | Transect 4, Point G | 42.64786911 | -80.32006073 |
| 61 | LPBHS04BE070704T004E | 07/07/2004 | Transect 4, Point E | 42.62997055 | -80.31967926 |
| 62 | LPBHS04BE070704T004D | 07/07/2004 | Transect 4, Point D | 42.62097931 | -80.31951141 |
| 63 | LPBHS04BE070704T004C | 07/07/2004 | Transect 4, Point C | 42.6119194 | -80.3190918 |
| 64 | LPBHS04BE070704T004A | 07/07/2004 | Transect 4, Point A | 42.59391022 | -80.32009125 |
| 65 | LPBHS04BE070704T004F | 07/07/2004 | Transect 4, Point F | 42.63898087 | -80.31973267 |

Appendix 6: Continued

| Map # | Field Number | Date | Locality | Latitude | Longitude |
|---|---|---|---|---|---|
| 66 | LPBHS04BE070704T003H | 07/07/2004 | Transect 3, Point H | 42.58638 | -80.36212158 |
| 67 | LPBHS04BE070704T004B | 07/07/2004 | Transect 4, Point B | 42.60289001 | -80.31965637 |
| 68 | LPBHS04BE070704T003A | 07/07/2004 | Transect 3, Point A | 42.64665985 | -80.35572052 |
| 69 | LPB04BE080704001 | 08/07/2004 | Shocking to and returning from 0-500 m northwest of Big Creek mouth, following shoreline contours. | 42.60206985 | -80.44819641 |
| 70 | LPB04BE080704002 | 08/07/2004 | Shocking from 1500-2000 m northwest of Big Creek mouth (shock 1500-2000, then 2000-1500), following shoreline contours. | 42.61373138 | -80.45204926 |
| 71 | LPB04BE080704003 | 08/07/2004 | Shock up and back between 300-3500 m northwest of Big Creek mouth, following shoreline contours | 42.62627029 | -80.44377899 |
| 72 | LPB04BE080704004 | 08/07/2004 | Shocking up and back from 4500 to 5000 m northwest of Big Creek mouth, following shoreline contours | 42.63753891 | -80.43109131 |
| 73 | LPB04BE080704005 | 08/07/2004 | Shocking up and back, between 6000-6500 m northwest from Big Creek mouth following shoreline contours. | 42.64997101 | -80.41802979 |
| 74 | LPB04BE080704006 | 08/07/2004 | Shocking between 7500-8000 m and back, northwest from Big Creek mouth following shoreline contours | 42.65803909 | -80.40135956 |
| 75 | LPBE090704007 | 09/07/2004 | Shocking from 9000-9500 m northwest of Big Creek mouth following shoreline contours (and back from 9500-9000 m) | 42.65969849 | -80.3849411 |
| 76 | LPB04BE090704008 | 09/07/2004 | Shocking between 10500-11000 m and back, northwest of Big Creek mouth following shoreline | 42.65596008 | -80.36813354 |
| 77 | LPB04BE090704009 | 09/07/2004 | Shocking between 12000-12500 m northwest of Big Creek mouth following shoreline contours | 42.6497612 | -80.34921265 |
| 78 | LPB04BE090704010 | 09/07/2004 | Shocking between 13500-14000 m northwest of Big Creek mouth following shoreline contours. | 42.64957047 | -80.33654022 |
| 79 | LPB04BE300804011 | 30/08/2004 | East of Sandbay Marina; west of Alex Channel | 42.59674072 | -80.43256378 |
| 80 | LPB04BE300804012 | 30/08/2004 | West of Alex Channel | 42.58935928 | -80.43300629 |
| 81 | LPB04BE300804013 | 30/08/2004 | Alex Channel; isolated (semi) pond | 42.58319092 | -80.43477631 |
| 82 | SPGR02-OLCT-001 | 19/06/2002 | Long Point, On | 42.59408951 | -80.39575195 |
| 83 | SPGR02-OLCT-002 | 19/06/2002 | Long Point, On | 42.59339142 | -80.40825653 |
| 84 | SPGR02-OLCT-003 | 19/06/2002 | Long Point, On | 42.58197021 | -80.41459656 |
| 85 | SPGR02-OLCT-004 | 19/06/2002 | Long Point, On | 42.58383942 | -80.40696716 |

Appendix 7: Locality description of the St. Clair NWA sites sampled.

| Map # | Field Number | Date | Locality | Latitude | Longitude |
|---|---|---|---|---|---|
| 1 | STCL05070605001 | 06/07/2005 | Southern corner of west impoundment | 42.35997009 | -82.40572357 |
| 2 | STCL05070605002 | 06/07/2005 | Mouth of channel opening into west dyke channel | 42.36198044 | -82.40760803 |
| 3 | STCL05070605003 | 06/07/2005 | 300 m north of channel that opens into west dyke channel, right by large deciduous tree, just off of dyke | 42.36408997 | -82.41074371 |
| 4 | STCL05070605004 | 06/07/2005 | 600 m north of Site 3, in far west corner | 42.36756134 | -82.41493225 |
| 5 | STCL05070705005 | 07/07/2005 | Northeast of Site 4 approximately 150 m along dyke, and 50 m out from dyke on small island of emergents | 42.36846924 | -82.41327667 |
| 6 | STCL05070605006 | 07/07/2005 | 200 m east of Site 5, just inside bay | 42.36845016 | -82.4105835 |
| 7 | STCL05070705007 | 07/07/2005 | In north corner of impoundment, right by channel opening to cottage; approximately 20 m northeast of opening | 42.37081909 | -82.40975189 |
| 8 | STCL05070705008 | 07/07/2005 | Little bay, just before channel opening to western impoundment | 42.370121 | -82.40837097 |
| 9 | STCL05070805009 | 08/07/2005 | East side of first little bay on your left after heading southeast from Haggeman's Cottage | 42.37371826 | -82.4065094 |
| 10 | STCL05070805010 | 08/07/2005 | Open water set, just before first bay channels behind Haggeman's Cottage | 42.37514877 | -82.40486145 |
| 11 | STCL05070805011 | 08/07/2005 | Opposite end of bay from Site 10 | 42.3758812 | -82.40309143 |
| 12 | STCL05070805012 | 08/07/2005 | In channel directly behind dock at Haggeman's Cottage | 42.37767029 | -82.40278625 |
| 13 | STCL05071205013 | 12/07/2005 | | 42.36167908 | -82.40289307 |
| 14 | STCL05071205014 | 12/07/2005 | | 42.36240005 | -82.4017868 |
| 15 | STCL05071205015 | 12/07/2005 | | 42.36310959 | -82.40075684 |
| 16 | STCL0507120516 | 12/07/2005 | | 42.36362076 | -82.39990997 |
| 17 | STCL05071405017 | 14/07/2005 | Just off of Balmoral Line | 42.3656311 | -82.39720154 |
| 18 | STCL05071405018 | 14/07/2005 | | 42.36645889 | -82.39584351 |
| 19 | STCL05071405019 | 14/07/2005 | | 42.36824036 | -82.39325714 |
| 20 | STCL05071405020 | 14/07/2005 | | 42.3782196 | -82.3989563 |

Appendix 8: Summary of sampling effort for Big Creek NWA sites.

| Map # | Capture Method | Effort | Units | Description |
|---|---|---|---|---|
| 1 | FN Large | 24* | Hours | Fyke Net, Large, 1" Mesh |
| 2 | FN Large | 24* | Hours | Fyke Net, Large, 1" Mesh |
| 3 | FN Large | 24* | Hours | Fyke Net, Large, 1" Mesh |
| 4 | FN Large | 24* | Hours | Fyke Net, Large, 1" Mesh |
| 5 | FN Large | 24* | Hours | Fyke Net, Large, 1" Mesh |
| 6 | Seine Net | 2 | Haul | Bag Seine, 1/4" mesh, Length - 8.5 m, 25 ft |
| 7 | FN Large | 24* | Hours | Fyke Net, Large, 1" Mesh |
| 8 | FN Large | 24* | Hours | Fyke Net, Large, 1" Mesh |
| 9 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 10 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 11 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 12 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 13 | FN Large | 24* | Hours | Fyke Net, Large, 1" Mesh |
| 14 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 15 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 16 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 17 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 18 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 19 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 20 | FN Large | 25 | Hours | Fyke Net, Large, 1" Mesh |
| 21 | FN Large | 25 | Hours | Fyke Net, Large, 1" Mesh |
| 22 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 23 | FN Large | 24* | Hours | Fyke Net, Large, 1" Mesh |
| 24 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 25 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 26 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 27 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 28 | BEF | 2396 | Seconds | SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom |
| 29 | BEF | 2063 | Seconds | SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom |
| 30 | BEF | 2685 | Seconds | SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom |
| 31 | BEF | 3241 | Seconds | SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom |
| 32 | BEF | 3104 | Seconds | SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom |

Appendix 9: Summary of Long Point NWA sampling effort.

| Map # | Capture Method | Effort | Units | Description of Method |
|---|---|---|---|---|
| 1 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 2 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 3 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 4 | FN Large | 25 | Hours | Fyke Net, Large, 1" Mesh |
| 5 | FN Large | 24* | Hours | Fyke Net, Large, 1" Mesh |
| 6 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 7 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 8 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 9 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 10 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 11 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 12 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 13 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 14 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 15 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 16 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 17 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 18 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 19 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 20 | FN Large | 25 | Hours | Fyke Net, Large, 1" Mesh |
| 21 | FN Large | 25 | Hours | Fyke Net, Large, 1" Mesh |
| 22 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 23 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 24 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 25 | BEF | 478 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 26 | BEF | 728 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 27 | BEF | 571 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 28 | BEF | 643 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 29 | BEF | 744 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 30 | BEF | 671 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 31 | BEF | 1125 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 32 | BEF | 893 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 33 | BEF | 557 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 34 | BEF | 469 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 35 | BEF | 780 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 36 | BEF | 841 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 37 | BEF | 0 | | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 38 | BEF | 865 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 39 | BEF | 100 | Seconds | E-fishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 40 | BEF | 100 | Seconds | E-fishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 41 | BEF | 100 | Seconds | E-fishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 42 | BEF | 100 | Seconds | E-fishing Boat, SR 20 ft, 7.5 GPP, dual boom |

Appendix 9: Continued

| Map # | Capture Method | Effort | Units | Description of Method |
|---|---|---|---|---|
| 43 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 44 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 45 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 46 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 47 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 48 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 49 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 50 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 51 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 52 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 53 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 54 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 55 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 56 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 57 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 58 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 59 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 60 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 61 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 62 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 63 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 64 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 65 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 66 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 67 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 68 | BEF | 100 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 69 | BEF | 1260 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 70 | BEF | 1607 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 71 | BEF | 1373 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 72 | BEF | 1764 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 73 | BEF | 1427 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 74 | BEF | 1238 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 75 | BEF | 1651 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 76 | BEF | 1313 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 77 | BEF | 1344 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 78 | BEF | 811 | Seconds | Electrofishing Boat, SR 20 ft, 7.5 GPP, dual boom |
| 79 | BEF | 730 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 80 | BEF | 765 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 81 | BEF | 674 | Seconds | E-fishing Boat, S-Rt 20 ft, 7.5 GPP, dual boom |
| 82 | BEF | 1236 | Seconds | SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom |
| 83 | BEF | 1553 | Seconds | SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom |
| 84 | BEF | 1480 | Seconds | SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom |
| 85 | BEF | 1630 | Seconds | SAR, 14' E-fishing Boat (LOWE), 5.0 kW, single boom |

Appendix 10: Summary of St. Clair NWA sampling effort.

| Map # | Capture Method | Duration (Hrs) | Units | Description of Method |
|---|---|---|---|---|
| 1 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 2 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 3 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 4 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 5 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 6 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 7 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 8 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 9 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 10 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 11 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 12 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 13 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 14 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 15 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 16 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 17 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 18 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 19 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |
| 20 | FN Large | 24 | Hours | Fyke Net, Large, 1" Mesh |

Appendix 11: Species captured by site at Big Creek NWA by DFO in 2005. COSEWIC status: EN – Endangered, SC – Special Concern

| **Species** | **Total** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alewife | **1** | | | | | | | | | | | | | | | | | |
| Black Bullhead | **2** | | | | | | | | | | | | | | | | | |
| Black Crappie | **41** | | | | | | | | | | | | | | | | | |
| Blackchin Shiner | **1** | | | | | | | | | 1 | | | | | | | | |
| Bluegill | **51** | 5 | | 6 | 3 | | 1 | | 1 | | | | | | 1 | | | 2 |
| Bluntnose Minnow | **10** | | | 1 | | 3 | 4 | | | | | | | | | | | |
| Bowfin | **11** | 1 | | | | | | | | | | | 1 | 1 | 1 | | | |
| Brook Silverside | **1** | | | | | | | | | | | | | | | | | |
| Brown Bullhead | **37** | | | 2 | 5 | | | 1 | 2 | | 4 | | 1 | | 2 | | | |
| Central Mudminnow | **1** | | | | | | | | | | | | | | | | | |
| Common Carp | **2** | | | | | | | | | | | | | | | | | |
| Emerald Shiner | **8** | | | | | 1 | 6 | 1 | | | | | | | | | | |
| Freshwater Drum | **2** | | | | | | | | | | | | | | | | | |
| Gizzard Shad | **5** | | | | | | | | | | | | | | | | | |
| Golden Shiner | **47** | 1 | 4 | 2 | 8 | | | | 2 | | | | 1 | | | | | |
| Grass Pickerel (**SC**) | **2** | | | | | | | | | | | | | | | | | |
| Lake Chubsucker (**EN**) | **13** | | | | | | | | | | | | | | | | | |
| Largemouth Bass | **7** | | | | | | | | 1 | | | | | 1 | | | | |
| Longnose Gar | **5** | | | | 1 | | | | 1 | 1 | 1 | 1 | | | | | | |
| Northern Pike | **4** | | | | | | | | | | | | | | | | | |
| Pumpkinseed | **156** | 15 | 1 | 30 | 14 | 1 | 3 | | 4 | 7 | | | 1 | 3 | 1 | | | 2 |
| Rainbow Trout | **1** | | | | | | | | 1 | | | | | | | | | |
| Rock Bass | **49** | | | 21 | 15 | 1 | 2 | | 3 | 2 | | | | | | | | |
| Warmouth (**SC**) | **11** | | | | | | | | | | | | | | | | | |
| Yellow Perch | **39** | | | 6 | 1 | | 6 | | | | | | | | | | | |
| **Total** | **507** | **22** | **5** | **68** | **47** | **6** | **22** | **2** | **15** | **11** | **5** | **1** | **4** | **5** | **5** | **0** | **0** | **4** |

Appendix 11: Continued

| **Species** | **Total** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** | **31** | **32** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alewife | **1** | | | | | | | | | | | 1 | | | | |
| Black Bullhead | **2** | | | | | | | | | | | | | 1 | | 1 |
| Black Crappie | **41** | | | 1 | | 1 | 16 | 1 | 20 | | 2 | | | | | |
| Blackchin Shiner | **1** | | | | | | | | | | | | | | | |
| Bluegill | **51** | 1 | | | | | | | | | | 6 | 5 | 2 | 9 | 9 |
| Bluntnose Minnow | **10** | | | | | | | | | | | 1 | | | | 1 |
| Bowfin | **11** | | 2 | 2 | | 1 | 1 | | 1 | | | | | | | |
| Brook Silverside | **1** | | | | | | | | | | | | | | | 1 |
| Brown Bullhead | **37** | 1 | | 2 | | | 1 | | 1 | | | 1 | | 1 | 7 | 6 |
| Central Mudminnow | **1** | | | 1 | | | | | | | | | | | | |
| Common Carp | **2** | | | | | | | | | | | | 1 | | | 1 |
| Emerald Shiner | **8** | | | | | | | | | | | | | | | |
| Freshwater Drum | **2** | | | | | | | | | | | | 1 | 1 | | |
| Gizzard Shad | **5** | | | | | | | | | | | 3 | 1 | | 1 | |
| Golden Shiner | **47** | | | | | 1 | 8 | 1 | 1 | 1 | 14 | 1 | | 1 | | 1 |
| Grass Pickerel (**SC**) | **2** | | | | | | | | | 1 | | | | 1 | | |
| Lake Chubsucker (**EN**) | **13** | | | 2 | | | 2 | | 1 | 7 | 1 | | | | | |
| Largemouth Bass | **7** | | | | | | | | | | | 2 | | | 1 | 2 |
| Longnose Gar | **5** | | | | | | | | | | | | | | | |
| Northern Pike | **4** | | | | | | | | | | | | 2 | 1 | 1 | |
| Pumpkinseed | **156** | 2 | 2 | 1 | | 3 | 21 | 4 | 1 | 3 | 1 | 11 | 4 | 6 | 10 | 5 |
| Rainbow Trout | **1** | | | | | | | | | | | | | | | |
| Rock Bass | **49** | | 1 | | | | | | | | | 2 | | | 2 | |
| Warmouth (**SC**) | **11** | | | | | | 10 | | | 1 | | | | | | |
| Yellow Perch | **39** | | | | | | | | | | | 6 | | | 12 | 8 |
| **Total** | **507** | **4** | **5** | **9** | **0** | **6** | **59** | **6** | **25** | **13** | **18** | **34** | **14** | **14** | **43** | **35** |

Appendix 12: Species caught by site at Long Point NWA by DFO in 2002, 2004 and 2005. COSEWIC status: EN – Endangere, SC – Special Concern

| Common Name | Total | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Banded Killifish | 13 | | | | | | 1 | | | | | | | | |
| Black Bullhead | 7 | | | | | | | | | | | | | | |
| Black Crappie | 12 | | | | | | | | | | | | | | |
| Blackchin Shiner | 186 | | 1 | | 1 | 1 | | | | | | | | | |
| Blacknose Shiner | 38 | | | | | | | | | | | | | | |
| Bluegill | 216 | | | 1 | 1 | | | | | | | | 2 | 1 | |
| Bluntnose Minnow | 98 | | | | | | | | | | | 1 | | | |
| Bowfin | 8 | | | | | | | | | | | | 2 | | |
| Brook Silverside | 17 | | | | | | | | | | | | | | |
| Brown Bullhead | 194 | | | 1 | | | | | | | | | 2 | | 1 |
| Channel Catfish | 1 | | | | | | | | | | | | | | |
| Common Carp | 33 | | | | | | | | | | | | | | |
| Emerald Shiner | 272 | | | | | | | | | | | | | | |
| Freshwater Drum | 12 | | | | | | | | | | | | | | |
| Gizzard Shad | 3 | | | | | | | | | | | | | | |
| Golden Shiner | 184 | | | 1 | 28 | | | | | | 1 | | | | |
| Goldfish | 13 | | | | | | | | | | | | | | |
| Grass Pickerel (SC) | 5 | | | | | | | | | | | | | | |
| Iowa Darter | 1 | | | | | | | | | | | | | | |
| Johnny Darter | 6 | | | | | | | | | | | | | | |
| Lake Chubsucker | 2 | | | | | | | | | | | | | | |
| Largemouth Bass | 143 | | | | | | | | | | | | | | |
| Log Perch | 3 | | | | | | | | | | | | | | |
| Longnose Gar | 33 | | | 2 | | 4 | | 1 | | 1 | | | | | |
| Mimic Shiner | 51 | | | | | | | | | | | | | | |
| Northern Pike | 15 | | | | | | | | | | | | | 1 | 1 |
| Pugnose Shiner | 30 | | | | | | | | | | | | | | |
| Pumpkinseed | 725 | 10 | 25 | 23 | 41 | 7 | 10 | | 1 | 28 | 4 | | | 1 | |
| Rock Bass | 33 | | | 2 | | | | | | | 3 | 1 | | | |
| Round Goby | 9 | | | | | | | | | | | | | | |
| Smallmouth Bass | 1 | | | | | | | | | | | | | | |
| Spotfin Shiner | 4 | | | | | | | | | | | | | | |
| Spottail Shiner | 11 | | | | | | | | | | | | | | |
| Tadpole Madtom | 19 | | | 6 | 1 | | | | | | | | | | 1 |
| Yellow Bullhead | 2 | | | | | | | | | | | | | | |
| Yellow Perch | 810 | | | 1 | | | | | | | | | | | |
| **Total** | **3210** | **10** | **26** | **37** | **72** | **12** | **11** | **1** | **1** | **29** | **8** | **2** | **6** | **3** | **3** |

Appendix 12: Continued

| Common Name | Total | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Banded Killifish | 13 | | | | | | | | | | | | | | |
| Black Bullhead | 7 | | | | | | | | | | | | | 2 | 1 |
| Black Crappie | 12 | | | | | | 12 | | | | | | | | |
| Blackchin Shiner | 186 | | | 1 | 2 | | | | | | | 12 | | 6 | |
| Blacknose Shiner | 38 | | | | | | | | | | | 1 | | | 1 |
| Bluegill | 216 | 2 | | | | | | | | 1 | | 2 | | 4 | 3 |
| Bluntnose Minnow | 98 | | | | | | | | | | | | | | |
| Bowfin | 8 | | | | | | | | | | | | | | |
| Brook Silverside | 17 | | | | | | | | | | | | 3 | | 1 |
| Brown Bullhead | 194 | 1 | | | | | 16 | | | 1 | | 7 | | 3 | 4 |
| Channel Catfish | 1 | | | | | | | | | | | | | | |
| Common Carp | 33 | | | | | | | | | | | | | | |
| Emerald Shiner | 272 | | | | | | | | | | | | 4 | 2 | |
| Freshwater Drum | 12 | | | | | | | | | | | | | | |
| Gizzard Shad | 3 | | | | | | | | | | | | | | |
| Golden Shiner | 184 | | | | | | 81 | | | | | 6 | | 3 | |
| Goldfish | 13 | | | | | | | | | | | | | | |
| Grass Pickerel (SC) | 5 | | | | | | | | | | | 1 | | | |
| Iowa Darter | 1 | | | | | | | | | | | | | | |
| Johnny Darter | 6 | | | | | | | | | | | | | | |
| Lake Chubsucker | 2 | | | | | | 1 | | | | | | | | |
| Largemouth Bass | 143 | | | | | | | | 1 | | | | 1 | 2 | 3 |
| Log Perch | 3 | | | | | | | | | | | | | | |
| Longnose Gar | 33 | | | | | | | | | | | | | | |
| Mimic Shiner | 51 | | | | | | | | | | | | | | |
| Northern Pike | 15 | | | | | | | | | | | | | | |
| Pugnose Shiner | 30 | | | | | | | | | | | | | | |
| Pumpkinseed | 725 | 1 | 10 | 50 | 4 | 10 | 72 | 2 | | | 1 | 2 | | 6 | 5 |
| Rock Bass | 33 | | | | | | | | | | | | 1 | 1 | |
| Round Goby | 9 | | | | | | | | | | | | 1 | | |
| Smallmouth Bass | 1 | | | | | | | | | | | | | | |
| Spotfin Shiner | 4 | | | | | | | | | | | | | | |
| Spottail Shiner | 11 | | | | | | | | | | | | | | |
| Tadpole Madtom | 19 | | | | 4 | 6 | | | | | | | | | |
| Yellow Bullhead | 2 | | | | | | | | | | | 1 | | | |
| Yellow Perch | 810 | | | | | | 1 | 1 | | | | 24 | | 34 | 29 |
| **Total** | **3210** | **4** | **10** | **51** | **10** | **16** | **183** | **3** | **1** | **2** | **1** | **56** | **10** | **63** | **47** |

Appendix 12: Continued

| Common Name | Total | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Banded Killifish | **13** | | 1 | | | | | | 4 | | 1 | | | | |
| Black Bullhead | **7** | | | | | | | | | | | | | | |
| Black Crappie | **12** | | | | | | | | | | | | | | |
| Blackchin Shiner | **186** | 10 | | 24 | 4 | 5 | 5 | 1 | 19 | 9 | 2 | | | | |
| Blacknose Shiner | **38** | | | 1 | | | | 5 | 5 | 5 | 1 | | | | |
| Bluegill | **216** | 10 | | | | 16 | 2 | 3 | 7 | 2 | 2 | | | | |
| Bluntnose Minnow | **98** | | | 8 | 1 | | | 5 | | 1 | 2 | | | | |
| Bowfin | **8** | 1 | 2 | 1 | | | | | | | | | | | |
| Brook Silverside | **17** | | | | | 1 | | | | | 2 | | | | |
| Brown Bullhead | **194** | 4 | 2 | 2 | | 7 | 3 | 6 | 2 | 11 | 6 | | 2 | | |
| Channel Catfish | **1** | | | | 1 | | | | | | | | | | |
| Common Carp | **33** | 1 | 2 | | 2 | | 2 | | 2 | 1 | | | | | |
| Emerald Shiner | **272** | | | | | 4 | | | | | 1 | 2 | | | |
| Freshwater Drum | **12** | | | | 1 | 1 | | 3 | | | | | | | |
| Gizzard Shad | **3** | | | | | 1 | | | | | | | | | |
| Golden Shiner | **184** | 2 | 1 | 2 | | 8 | | | | 11 | 12 | | | | |
| Goldfish | **13** | | | | | 1 | | | | | | | | | |
| Grass Pickerel (**SC**) | **5** | | | | | | | | 1 | | | | | | |
| Iowa Darter | **1** | | | | | | | | | | | | | | |
| Johnny Darter | **6** | | | | | | | | | 1 | | | | | |
| Lake Chubsucker | **2** | 1 | | | | | | | | | | | | | |
| Largemouth Bass | **143** | 1 | 2 | 3 | 3 | 4 | 1 | 5 | 9 | 4 | 3 | | | | |
| Log Perch | **3** | | | | | | | 1 | | | 1 | | | | |
| Longnose Gar | **33** | | 9 | 1 | 5 | | | | | | | | | | |
| Mimic Shiner | **51** | | | | 1 | | | 6 | 1 | | 12 | | | | |
| Northern Pike | **15** | | | | | 1 | | 2 | | 2 | 1 | | | | |
| Pugnose Shiner | **30** | 2 | | | | | 1 | | 2 | 1 | 1 | | | | |
| Pumpkinseed | **725** | 2 | 2 | 14 | 14 | 24 | 2 | 3 | 17 | 13 | 17 | | | | |
| Rock Bass | **33** | | | | 1 | 2 | | | 4 | | | | | | |
| Round Goby | **9** | | | | | | | | | | | | | | |
| Smallmouth Bass | **1** | | | | | | | | | | | | | | |
| Spotfin Shiner | **4** | | | | 4 | | | | | | | | | | |
| Spottail Shiner | **11** | | | | | 3 | | | | | 1 | | | | |
| Tadpole Madtom | **19** | | | | | | | | | | | | | | |
| Yellow Bullhead | **2** | | | | | | | | | | | | | | |
| Yellow Perch | **810** | 22 | 5 | 28 | 26 | 48 | 10 | 5 | 20 | 89 | 60 | 1 | | | |
| **Total** | **3210** | **56** | **26** | **84** | **63** | **126** | **26** | **45** | **93** | **150** | **125** | **3** | **2** | **0** | **0** |

Appendix 12: Continued

| Common Name | Total | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Banded Killifish | 13 | | | | | | | | | | | | | | |
| Black Bullhead | 7 | | | | | | | | | | | | | | |
| Black Crappie | 12 | | | | | | | | | | | | | | |
| Blackchin Shiner | 186 | | | | | 1 | | | | | | | | | |
| Blacknose Shiner | 38 | | | | | | | | | | | | | | |
| Bluegill | 216 | | | | | | | | | | | | | | |
| Bluntnose Minnow | 98 | | | | | | | | | | | | | | |
| Bowfin | 8 | | | | | | | | | | | | | | |
| Brook Silverside | 17 | | | | | | | | | | | | | | |
| Brown Bullhead | 194 | | | 1 | | | | | | | | | | | |
| Channel Catfish | 1 | | | | | | | | | | | | | | |
| Common Carp | 33 | | | | | | | | | | | | | | |
| Emerald Shiner | 272 | 8 | 10 | 4 | 1 | | 3 | 3 | 14 | 9 | | | | 8 | 6 |
| Freshwater Drum | 12 | | | | | 2 | | | | | | | | | |
| Gizzard Shad | 3 | | | | | | | | | | | | | | |
| Golden Shiner | 184 | | | | | | | 1 | | | | | | | |
| Goldfish | 13 | | | | | | | | | | | | | | |
| Grass Pickerel (SC) | 5 | | | | | | | | | | | | | | |
| Iowa Darter | 1 | | | | | | | | | | | | | | |
| Johnny Darter | 6 | | | | | | | | | | | | | | |
| Lake Chubsucker | 2 | | | | | | | | | | | | | | |
| Largemouth Bass | 143 | | | 1 | | | | | | | | | | | |
| Log Perch | 3 | | | | | | | | | 1 | | | | | |
| Longnose Gar | 33 | | | | | | | | | | | | | | |
| Mimic Shiner | 51 | | | | | | | | | | | | | | |
| Northern Pike | 15 | | | | | | | | | | | | | | |
| Pugnose Shiner | 30 | | | | | 1 | | | | | | | | | |
| Pumpkinseed | 725 | | | | 1 | 1 | | | | | | | | | |
| Rock Bass | 33 | | | | | | | | | | | | | | |
| Round Goby | 9 | | | | | | | | | | | | | | |
| Smallmouth Bass | 1 | | | | | | | | | | | | | | |
| Spotfin Shiner | 4 | | | | | | | | | | | | | | |
| Spottail Shiner | 11 | | | | | | | | | | | | | | |
| Tadpole Madtom | 19 | | | | | | | | | | | | | | |
| Yellow Bullhead | 2 | | | | | | | | | | | | | | |
| Yellow Perch | 810 | | | | 5 | 1 | | | | 3 | | | | | |
| **Total** | **3210** | **8** | **10** | **6** | **7** | **6** | **3** | **4** | **14** | **13** | **0** | **0** | **0** | **8** | **6** |

Appendix 12: Continued

| Common Name | Total | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Banded Killifish | 13 | | | | | | | | | | | | | | | |
| Black Bullhead | 7 | | | | | | | | | | | | | | | |
| Black Crappie | 12 | | | | | | | | | | | | | | | |
| Blackchin Shiner | 186 | | | | | | | | | | 12 | | | 1 | 2 | 9 |
| Blacknose Shiner | 38 | | | | | | | | | | | | | | | |
| Bluegill | 216 | | | | | | | | 1 | | | | | 13 | 10 | 3 |
| Bluntnose Minnow | 98 | | | | | | | | | | 1 | | | 9 | | 2 |
| Bowfin | 8 | | | | | | | | | | | | | | | |
| Brook Silverside | 17 | | | | | | | | 2 | | | | | | 2 | 1 |
| Brown Bullhead | 194 | | | | | | | | | | | | 1 | | 18 | 6 |
| Channel Catfish | 1 | | | | | | | | | | | | | | | |
| Common Carp | 33 | | | | | | | | | | | | | 1 | 6 | 4 |
| Emerald Shiner | 272 | 10 | | | | 1 | | | | 1 | 1 | | | 27 | | 1 |
| Freshwater Drum | 12 | | | | | | | | | | | | | | | |
| Gizzard Shad | 3 | | | | | | | | | | | | | | 2 | |
| Golden Shiner | 184 | | | | | | | | | | | | | 2 | 3 | 1 |
| Goldfish | 13 | | | | | | | | | | | | | | 3 | 3 |
| Grass Pickerel (SC) | 5 | | | | | | | | | | | | | | 1 | |
| Iowa Darter | 1 | | | | | | | | | | | | | | | |
| Johnny Darter | 6 | | | | | | | | | | | | | | | |
| Lake Chubsucker | 2 | | | | | | | | | | | | | | | |
| Largemouth Bass | 143 | | | | | | | | | | | | | | 5 | 5 |
| Log Perch | 3 | | | | | | | | | | | | | | | |
| Longnose Gar | 33 | | | | | | | | | | | | | | | |
| Mimic Shiner | 51 | | | | | | | | | | | | | | | |
| Northern Pike | 15 | | | | | | | | | | | | | | | |
| Pugnose Shiner | 30 | | | | | | | | | | 1 | | | 2 | | 11 |
| Pumpkinseed | 725 | 1 | | | | | | | | | | | | 59 | 10 | 15 |
| Rock Bass | 33 | | | | | | | | | | | | | 1 | | |
| Round Goby | 9 | | | | | | | | | | | | | | | 1 |
| Smallmouth Bass | 1 | 1 | | | | | | | | | | | | | | |
| Spotfin Shiner | 4 | | | | | | | | | | | | | | | |
| Spottail Shiner | 11 | | | | | | | | | | | | | 1 | | |
| Tadpole Madtom | 19 | | | | | | | | | | | | | | | |
| Yellow Bullhead | 2 | | | | | | | | | | | | | | | |
| Yellow Perch | 810 | | | | | | | | | | 1 | 1 | | 50 | 28 | 42 |
| **Total** | **3210** | **12** | **0** | **0** | **0** | **1** | **0** | **0** | **3** | **1** | **16** | **1** | **1** | **166** | **90** | **104** |

Appendix 12: Continued

| Common Name | Total | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Banded Killifish | **13** | | | | | | | 1 | 1 | | 4 | | | | |
| Black Bullhead | **7** | | | | | | | | | | | 4 | | | |
| Black Crappie | **12** | | | | | | | | | | | | | | |
| Blackchin Shiner | **186** | 7 | 2 | 2 | 22 | | 7 | 14 | | | 4 | | | | |
| Blacknose Shiner | **38** | | | | 1 | | | | 2 | | 16 | | | | |
| Bluegill | **216** | 13 | 11 | 7 | 22 | 14 | 5 | 1 | 7 | 2 | 5 | 7 | 14 | 13 | 9 |
| Bluntnose Minnow | **98** | 10 | 10 | 1 | 4 | 1 | 6 | 1 | 4 | | 25 | 1 | 5 | | |
| Bowfin | **8** | | 1 | 1 | | | | | | | | | | | |
| Brook Silverside | **17** | | 1 | 1 | | | 1 | | | 1 | | | | | 1 |
| Brown Bullhead | **194** | 14 | 11 | 8 | 14 | 2 | 2 | 2 | 18 | 6 | | | 7 | 1 | 2 |
| Channel Catfish | **1** | | | | | | | | | | | | | | |
| Common Carp | **33** | 4 | 2 | 2 | 1 | | 3 | | | | | | | | |
| Emerald Shiner | **272** | 3 | 6 | 81 | 31 | 3 | 24 | 3 | 1 | | | | | | |
| Freshwater Drum | **12** | | | 3 | | 1 | | | | | | | | | 1 |
| Gizzard Shad | **3** | | | | | | | | | | | | | | |
| Golden Shiner | **184** | 4 | 7 | 1 | 3 | | 1 | 1 | 1 | | | | 1 | 1 | 1 |
| Goldfish | **13** | 1 | 3 | 2 | | | | | | | | | | | |
| Grass Pickerel (**SC**) | **5** | | | | 2 | | | | | | | | | | |
| Iowa Darter | **1** | | | | | | | | | | | 1 | | | |
| Johnny Darter | **6** | | | | | | | | | 1 | 4 | | | | |
| Lake Chubsucker | **2** | | | | | | | | | | | | | | |
| Largemouth Bass | **143** | 9 | 6 | 20 | 11 | 4 | 15 | 3 | 1 | 5 | 12 | 2 | 1 | | 1 |
| Log Perch | **3** | | | | | | | | | | | | | | |
| Longnose Gar | **33** | 2 | 8 | | | | | | | | | | | | |
| Mimic Shiner | **51** | | | | | | | | 19 | | 3 | 6 | 3 | | |
| Northern Pike | **15** | | | | 2 | 1 | | | | | | 1 | | | 3 |
| Pugnose Shiner | **30** | 1 | | | 3 | | | | 2 | | 2 | | | | |
| Pumpkinseed | **725** | 17 | 13 | 6 | 43 | 7 | 8 | 7 | 17 | 17 | 74 | | 2 | 5 | 1 |
| Rock Bass | **33** | 2 | 1 | | 13 | | 1 | | | | | | | | |
| Round Goby | **9** | | | | | | | 7 | | | | | | | |
| Smallmouth Bass | **1** | | | | | | | | | | | | | | |
| Spotfin Shiner | **4** | | | | | | | | | | | | | | |
| Spottail Shiner | **11** | | | | | | | | 6 | | | | | | |
| Tadpole Madtom | **19** | | | | | | | | | | | 1 | | | |
| Yellow Bullhead | **2** | | | | 1 | | | | | | | | | | |
| Yellow Perch | **810** | 39 | 32 | 21 | 27 | 10 | 26 | 30 | 37 | 12 | 18 | 7 | 10 | 5 | 1 |
| **Total** | **3210** | **126** | **114** | **156** | **200** | **43** | **99** | **70** | **116** | **44** | **167** | **30** | **43** | **25** | **20** |

Appendix 13: Species caught per site at St. Clair NWA by DFO in 2005.

| Common Name | Total | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Black Crappie | **10** | | | | | | | 1 | | | | | | | | | | 5 | 4 | | |
| Bluegill | **19** | 1 | | 8 | | | 3 | | 2 | 1 | | 2 | 1 | | | | | | | | 1 |
| Bowfin | **17** | | | | 1 | | | | | | | 2 | | 4 | | 3 | 3 | 1 | | 1 | 2 |
| Brown Bullhead | **2** | | 1 | 1 | | | | | | | | | | | | | | | | | |
| Central Mudminnow | **1** | | | | | | | | | | | | | | | | | | | | 1 |
| Common Carp | **1** | | | | | | | | | | | | | | 1 | | | | | | |
| Golden Shiner | **4** | | | | | | | | | 2 | | | | 1 | | | | 1 | | | |
| Goldfish | **6** | | | | | | | | | | | | | | | | | | 6 | | |
| Largemouth Bass | **33** | 3 | 2 | 9 | | | | 2 | 1 | | | | 2 | | | | | 8 | 4 | 1 | 1 |
| Northern Pike | **5** | 1 | | 2 | | | | | | | 1 | | 1 | | | | | | | | |
| Pumpkinseed | **35** | 3 | 1 | 10 | | 1 | | | | | | 2 | 1 | 3 | | | 5 | 4 | 2 | | 3 |
| Smallmouth Bass | **1** | | | | | 1 | | | | | | | | | | | | | | | |
| **Total** | **134** | **8** | **4** | **30** | **1** | **2** | **3** | **3** | **3** | **3** | **1** | **6** | **5** | **8** | **1** | **3** | **8** | **19** | **16** | **2** | **8** |